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GEOLOGY ADJACENT TO HIGHWAY 11 IN BEST TOWNSHIP AND THE SOUTH PART OF GILLIES LIMIT TOWNSHIP DISTRICTS OF TIMISKAMING AND NIPISSING

By

Robert Thomson

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GEOLOGICAL BRANCH
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J. E. Thomson,
Director, Geological Branch.

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Abstract

The area described in this report is adjacent to Highway 11 where it traverses Best township and the southern part of Gillies Limit township.

The bedrock exposed in the area is Precambrian in age. The Archean rocks consist of Keewatin volcanics, granitic rocks, mafic and ultramafic intrusive rocks, and Proterozoic rocks of Huronian Cobalt Group sediments and Keweenawan intrusive rocks.

A complete geological map of the townships was not attempted; only those places conveniently accessible to the highway were examined. Geological mapping was supplemented by information from assessment work reports filed with the Ontario Department of Mines.

A number of mineral occurrences of economic interest containing nickel, copper, molybdenum, gold, cobalt and silver are known as well as industrial minerals such as pyrite, sand, gravel and ballast. No important mine has been developed to date but further prospecting appears to be warranted. The deposits are similar to those occurring in the Timagami area to the south.

The deposits and the exploration carried out on them is described in detail.

GEOLOGY ADJACENT TO HIGHWAY 11 IN BEST TOWNSHIP AND THE SOUTH PART OF GILLIES LIMIT TOWNSHIP

By ROBERT THOMSON[1]

INTRODUCTION

The area covered by this report is that conveniently accessible to Highway 11 where the highway traverses the south part of Gillies Limit and Best township. The map-area is 15 miles south of the town of Cobalt. Highway 11 and the Ontario Northland Railway cross the area. Bush roads give access to most parts of it.

The Trans-Canada Pipe Lines gas pipeline is adjacent to Highway 11.

There are no producing mines and only one past-producing mine in the area, but numerous mineral occurrences have been discovered.

Field Work

Field work was carried out by the writer in 1966. The purpose of the report is primarily to put on record geological information of economic significance. The writer's field work

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[1] Former Resident Geologist, Ontario Department of Mines, Cobalt, Ontario. Manuscript received by The Director, Geological Branch, 14 Dec. 1967.

was to supplement information contained in assessment work reports or made available by companies or individuals from the results of their prospecting activities. A base map was compiled by the author from Ontario Department of Lands and Forests, Forest Resources Inventory sheets 472793 and 472794 (scale one inch to 20 chains) with additional topographic information and including the lines between the Gillies Limit Blocks.

The help obtained from mining companies, in particular Nickel Rim Mines Ltd., by making available results of prospecting activities is gratefully acknowledged.

Previous Geological Work

The map-area is part of a large area mapped and described by Barlow (1899).

Miller (1910) described that part of the map-area within Gillies Limit township, and Todd (1925 and 1926) described that part in Best township.

Aeromagnetic Maps

Aeromagnetic maps covering the map-area are available (Geol. Surv. Canada, Maps 510G and 1491G).

Topography

Contoured topographic maps of the area are National Topographic Series, Timagami, 31 M/4E and 31 M/4W.

The relief is about 200 feet with elevations ranging for the most part between 1,000 and 1,200 feet above sea level.

Lakes in the map-area include Rib (elevation 1,025 feet), Rory, Whitney, Ingersoll, James, Granite, and Petraut. Rib Lake is drained by Rib Lake Creek to Petraut Lake which drains by Petraut Lake Creek into Duncan Lake, which is on the Best-Cassels township line.

Drainage is ultimately into Lake Timiskaming by way of Net, Cassels, and Rabbit lakes and the Matabitchuan River.

In most parts of the map-area rock outcrops are plentiful.

Natural Resources

In former times lumbering was an important industry. The numerous lakes, picturesque scenery and good transportation have made possible a summer tourist industry. In general the area is not suitable for agriculture.

GENERAL GEOLOGY

All the bedrock of the map-area is Precambrian in age; it includes both Archean as well as Proterozoic rocks. The surficial deposits are of Pleistocene age and are mainly of glacial origin.

A Table of Formations is given below:

TABLE OF FORMATIONS

Cenozoic
- Recent
  - Swamp and stream deposits
- Pleistocene
  - Boulder clay, sand, gravel

Unconformity

Precambrian
- Proterozoic
  - Keweenawan
    - Diabase (dikes)

      Intrusive contact
    - Quartz diabase (Nipissing diabase sill)

      Intrusive contact
  - Huronian
    - Cobalt Group
      - Firstbrook Formation
        - Argillite
      - Coleman Formation
        - Conglomerate, arkose

Unconformity

- Archean
  - Matachewan
    - Diabase, altered (dikes)

      Intrusive contact
  - Algoman
    - Granite, granodiorite, diorite, hornblendite, quartz porphyry (dikes)
    - Biotite granite

      Intrusive contact
  - Haileyburian
    - Lamprophyre (dikes)
    - Gabbro, peridotite, metapyroxenite, (Whitney Lake intrusions)

      Intrusive contact
  - Keewatin
    - Mafic and intermediate lavas, felsic volcanics, bedded tuffs, diabase (sills and dikes)

ARCHEAN

Keewatin

Miller (1910, p. 48-60) described under the term 'Keewatin Complex' the most ancient rocks in the vicinity of Cobalt including rhyolitic, andesitic, and basaltic lavas, associated small intrusive bodies, and associated sedimentary rocks. The term Keewatin is used similarly in this report for the usually nearly vertical and highly altered volcanic rocks, the oldest in the map-area.

Distribution and Structure

Keewatin rocks occur in many places along Highway 11 from Whitney Lake, in Gillies Limit to Strathy township.

In general the west contact of the Keewatin rocks is with younger batholithic intrusive rocks, the east contact with overlying younger Huronian sedimentary rocks.

In Block 90, Gillies Limit, northeast of Rory Lake (see Figure 2) an area of andesite, commonly with pillows, lies between the Whitney Lake intrusions, to the southwest, and

Cobalt Group sedimentary rocks to the northeast. The strike of the flows is northwest and the tops face to the northeast.

In Block 90, Gillies Limit, on the north side of Whitney Lake a band of Keewatin rocks consists of felsic volcanics which strike a little north of west and dip 55°-75°N. The volcanics are intruded by dikes of various kinds.

In Gillies Limit Block 95 and crossing Highway 11 is a band of felsic volcanics which strikes somewhat west of north and dips 65-75°NE.

Along Highway 11 from Gillies Limit Block 97 to Granite Lake in Best township is a band of Keewatin volcanics, largely andesite and in places showing pillow structure. The strike of the flows is northerly and the tops, for the most part at least, are to the east. In many places in this band difficulty in determining whether the rock is lava or intrusive was experienced. The similarity between 'Keewatin diabase' and Matachewan diabase adds a further uncertainty.

At the south end of James Lake at the Northland Pyrites mine is a pyrite-bearing zone in a band of Keewatin bedded tuffs. The pyrite-bearing zone appears to be a stratigraphic horizon; the zone has been traced over a distance of about three quarters of a mile in direction a few degrees east of north by geophysical work and diamond drilling.

The attitudes of the Keewatin rocks as a whole in the map-area appear to be concordant with the contact between the

Keewatin and Algoman batholithic intrusions. In places the Keewatin volcanics have been markedly altered to schist. Thus in Best township at the southwest corner of James Lake pillow structure in andesite has been distorted to show in plan as areas about 6 feet long and 6 inches wide.

Lithology

The Keewatin rocks in the map-area are composed of altered volcanic rocks (metavolcanics). The volcanics include lavas, volcanic sediments and intrusions thought to be related closely to the volcanics.

Todd (1926, p. 84-89) described the Keewatin volcanics in the township westerly and southwesterly of the map-area under the headings of basic lava, acid lava, agglomerate, and tuff; those in the township easterly and southeasterly of the map-area he described (1925, p. 7-9) under the headings of basic lava, amygdaloidal lava, quartz porphyry, sericitic schist, and iron formation.

The Keewatin volcanics in the map-area may be assigned to one of two categories either mafic and intermediate volcanics or felsic volcanics. As used in this report a mafic or intermediate lava is a dark coloured rock containing amygdules or showing pillow structure, or an association with known volcanics. The unmetamorphosed equivalents of the mafic and intermediate lavas are basalts and andesites. The name greenstone is used for a massive green rock in which metamorphism is so advanced that the origin of the rock, whether intrusive, effusive, or tuffaceous, is in doubt. In places the mafic and intermediate lavas have been altered to schist.

The useful term 'Keewatin diabase' is sometimes used locally for small mafic intrusions, usually concordant with the enclosing Keewatin volcanic rocks and which have clearly undergone the same metamorphism. The bodies of Keewatin diabase appear to be altered diabasic sills or dikes intruded at about the same time as the enclosing flows. Bodies of such Keewatin diabase are of common occurrence in the Keewatin rocks along Highway 11 in Best township between Gillies Limit and Granite Lake. Lithologically they are similar to or even indistinguishable in hand specimen from the Matachewan diabase in the outcrops along Highway 11 at the bridge over Granite Lake Creek.

In this report felsic volcanics refers to grey volcanic rocks which may be free of fragments or may contain them abundantly. An example of fragment-free felsic lava is exposed on the east side of Highway 11 at about 1,500 feet north of the south boundary of Block 90, Gillies Limit. The massive rock has conchoidal fracture and in places is banded. Dark minerals are present in quite minor amount. Immediately south of the exposure mentioned above is felsic lava with numerous fragments; in this felsic fragmental rock whitish areas, in elongate shapes to 2 mm. long, are in parallel to sub-parallel streaks; the whitish areas are not sharply marked off from the matrix.

On the same outcrop south of the exposure mentioned above is a felsic breccia with elongate fragments up to 15 inches in length.

Well bedded Keewatin rock, thought to be tuff, is exposed in the southwest corner of T26934, Block 95, Gillies Limit. The beds, commonly 1/8 to 1/2 inch thick, are white to dark grey; in part they are soft, in part hard and siliceous. Pyrite and pyrrhotite are commonly present and in places comprise up to 25 percent of the rock. Similar rocks occur at the Northland Pyrites mine in Best township at the south end of James Lake.

Haileyburian

In this report certain post-Keewatin mafic and ultramafic intrusive rocks in the map-area are designated Haileyburian.

Miller and Knight (1920a, p. 653, republished as 1920b, p. 235) introduced the name "Haileyburian" for certain intrusive rocks including peridotite, diabase, and lamprophyre that are post-Timiskaming and pre-Algoman in age. Although in the map-area Timiskaming sedimentary rocks that would permit age comparison are not known and the pre-Algoman age of all the intrusions is not completely proved use of the name "Haileyburian" is convenient. The intrusions designated

Haileyburian in the map-area include large mafic and ultramafic bodies adjacent to Whitney Lake (Blocks 90, 91, 95 and 96 Gillies Limit) and a few minor lamprophyre dikes.

Knight (1920, p. 209, 210) described similar intrusive rocks, including serpentine, periodite, diabase, and gabbro, in the adjacent township of Strathy as pre-Algoman, and Todd (1926, p. 89) writing of the same rocks, in addition to showing them as pre-Algoman, designated them as "Haileyburian (?)".

Moorhouse (1942, p. 12) presumably did not regard the pre-Algoman age of the peridotites described by Knight to have been established with certainty; he refers to them as "Pre-Algoman (?)".

Haileyburian mafic and ultramafic rocks in the vicinity of Dieter Lake (Block 90, Gillies Limit) and Whitney Lake (Blocks 90 and 91, Gillies Limit) have been referred to by prospectors and developers investigating nickel-copper deposits in the vicinity as members of the 'gabbro group' or of the 'diorite group'; the present writer suggests that a geographical expression be used for the assemblage and proposes the name 'Whitney Lake intrusions'.

Whitney Lake Intrusions

Two areas of Whitney Lake intrusions are shown on Figure 1; a large area for the most part in Gillies Limit Blocks 90 and 91 north of Whitney Lake, and a smaller area, also near Whitney Lake, a little south of this in Blocks 90 and 95. The two areas are separated by a 500-foot wide belt of Keewatin felsic volcanics.

Possibly the intrusive rocks in the two areas should not be grouped; in the Block 90 and 95 area, which was not carefully examined, only gabbroic rocks were seen.

The area in Gillies Limit, Blocks 90 and 91, in which Whitney Lake intrusive rocks are exposed extends easterly from a little west of Dieter Lake nearly to Rib Lake, a distance of about 6,600 feet, and northerly from Whitney Lake for about 4,000 feet; this area is bounded on the west, north, and to some extent the east side by younger overlying Huronian sedimentary rocks and little information on the distribution of the mafic intrusive rocks beneath these is available. The aeromagnetic map (Geol. Surv. Canada 1491G), although helpful, does not seem to afford unequivocal delineation of the area of the Whitney Lake intrusive rocks either at rock surface or where covered by the younger Huronian sedimentary rocks.

The Whitney Lake intrusive rocks appear to be in contact with Keewatin pillow lavas northwest of Rory Lake (Gillies Limit, Block 90) but the actual contact was not seen. South of Rory Lake they are in intrusive contact with Keewatin felsic volcanics. South of Dieter Lake it is inferred that the Whitney Lake intrusive rocks are in contact with granitic rocks of Algoman age but exposures were insufficient to show this directly.

Lithology:

In general the Whitney Lake intrusive rocks are either gabbroic rocks, in which plagioclase feldspar is present (or was prior to alteration) as an essential mineral, or ultramafic rocks made up of alteration minerals from pyroxene or olivine, and to some extent original hornblende; feldspar is absent. All the ultramafic rocks seen by the writer were highly altered; no unaltered olivine and very minor amounts of unaltered pyroxene were seen.

The ultramafic rocks are of two kinds, which can usually be distinguished in hand specimen, either peridotite or metapyroxenite.

The writer designates as peridotite those magnesia-rich ultramafic rocks in which pseudomorphs after olivine can be made out or in which abundant talc suggests the former presence of olivine.

Metapyroxenite is used for ultramafic rocks in which amphibole is the most abundant mineral. Most of the amphibole appears to be derived from pyroxene. Olivine or its alteration products are absent, no pyroxene is present, nor is there evidence of the former presence of magnesia-rich pyroxenes.

Identification of the Whitney Lake intrusive rocks as either gabbroic or ultramafic rocks, and as peridotite and metapyroxenite requires careful examination and may be tedious.

Distribution of Varieties:

In general present information is insufficient to permit precise delineation of the areas underlain by gabbro, peridotite, and metapyroxenite. Most of the prospectors and developers investigating the nickel-copper deposits near Dieter and Whitney lakes did not distinguish between these rock types in surface mapping and core logging.

The writer estimates that at bedrock surface gabbroic rocks make up more than 90 percent of the Whitney Lake intrusions. On Figure 2 the writer shows in the area of Whitney Lake intrusions those localities where peridotite is exposed, or was intersected by a drill hole by the letter "P", and the localities of metapyroxenite by the letter "A" but no attempt is made to outline the bodies of peridotite or metapyroxenite.

Gabbro:

The gabbroic rocks vary in appearance because of the amount and kind of alteration which they have undergone, but to some extent to variation in original composition and in grain size. Alteration of all the gabbroic rocks is so extensive that they may be referred to as metagabbros.

Outcrops of gabbroic rock are exposed along Highway 11 south of Rory Lake (Block 90, Gillies Limit). A finer grained variety, with less alteration than usual, is exposed at about

1,500 feet south of Rory Lake; it is a massive rock with dull white feldspar, 1-2mm. in grain size, forming about half the rock, and dark green hornblende of about the same grain size the rest. An outcrop of gabbro of somewhat coarser grain size (to about 5 mm.) is exposed on the west side of Highway 11 immediately north of Rory Lake. In a few places very coarse-grained segregations are present in the gabbro. Much of the gabbro has a grain size of about 3 mm. Under the microscope the feldspar is seen to be completely altered to saussurite (zoisite, white mica and albite). Quartz is an accessory mineral, forming about 1 percent of the rock.

One variety of the gabbro, which might be designated saussurite gabbro is exposed by the side of Highway 11 at the south end of Rory Lake. The saussurite gabbro is light grey to whitish made up to a large extent of saussuritized feldspar and with the original hornblende altered to light green fibrous and inconspicuous amphibole. Saussurite gabbro is exposed at surface near D.H. NR 11, north of Dieter Lake, and in the drill hole from 7 to about 243 feet.

Quartz gabbro or uralite quartz gabbro is exposed on surface just south of Dieter Lake and was intersected in D.H. N 2 and 9, west of Highway 11. Blue quartz grains, 2 to 3 mm. in size, usually make up 5 to 10 percent of this rock. Amphibole is commonly the most abundant mineral, in part as an alteration of pyroxene; plagioclase is highly saussuritized.

In many places the gabbro contains greenstone inclusions. Examples of this are in outcrops on the sides of Highway 11 near the causeway over Whitney Lake.

Peridotite:

The altered peridotite of the Whitney Lake intrusions is a dark grey to black soft rock; the point of a geological pick dragged across an outcrop makes a distinct furrow. The joints on an outcrop commonly show a characteristic weathering. On the side of peridotite drill core the former olivine crystals are commonly represented by one to two mm. light grey-green spots now largely aggregates of talc and magnesite, being alteration products of olivine in a dark fine-grained matrix, containing abundant antigorite and talc. Commonly a poikilitic texture can be seen since dull-coloured inclusions, about one mm. in size, of altered olivine are enclosed in hornblende crystals, up to 2 cm. in size, which show their characteristic flashing cleavages. The presence of abundant talc imparts the characteristic talcose feel to the rock; in places schisting has altered the rock to a talc schist. Rarely small bands of light green talc are present. The original magnesia-rich olivine and pyroxene of the peridotite have altered to magnesia-rich alteration minerals, principally talc, antigorite and magnesite. The writer estimates that most of the rocks designated peridotite in this report had an olivine content between 5 and 50 percent with the remainder originally pyroxene for the most part with smaller amounts of hornblende.

A list of localities, shown on Figure 2, where peridotite has been found is given below.

P-1, Block 83, Gillies Limit, west of Highway 11. Peridotite outcrops; no information on the size, shape, or attitude of the body is available.

P-2, Block 83. Peridotite is exposed over a few square feet on what is thought to be an outcrop on the west side of Highway 11.

P-3, Block 83. Drill hole CHN 3 (C.H. Niemetz Assessment Work Report, Gillies Limit, Block 90) was reported by O'Neill to have intersected peridotite over nearly its complete length. Drill hole CHN 4 (C.H. Niemetz Group, Assessment Work Report, Gillies Limit, Block 90) was reported by Benner to have intersected ultramafic rocks.

P-4, Block 90. Peridotite outcrops on the road from Highway 11 to Rib Lake. In two drillholes CHN 1 and CHN 2 (C.H. Niemetz Assessment Work Report, Gillies Limit, Block 90) drilled near the outcrop, peridotite intersections were reported by O'Neill.

P-5, Block 90. Peridotite outcrops on the road going east from Highway 11 at Rory Lake to Camp Bay-Lee-Mac on Rib Lake.

P-6, Block 90. Peridotite was intersected in drill hole NR-2 from rock surface to more than footage 145. Probably peridotite was also intersected in drill holes NR-1, 3, 4, 5 but the cores from these holes were not examined by the writer and peridotite is not recorded in the logs.

P-7, Block 90. In drill hole NR 6 (drilled south at -60 degrees) peridotite was intersected from footage 427 to footage 496; the contact at 496 is with Keewatin rhyolite; at the contact is a fissile chlorite schist. A geological section along the drill hole is given in Figure 3 and on this the inferred attitudes of the contacts are shown.

P-8, Block 91, north of Dieter Lake. In drill hole N 11 (drilled south at -74 degrees) peridotite was intersected from about footage 972 to footage 1,275 (the end of the hole). A geological section along the drill hole is shown in Figure 4 with inferred attitudes of contacts. The writer believes that peridotite was intersected in many of the drill holes in this vicinity but this is not shown in the drill logs.

<u>Metapyroxenite</u>:

Occurrences of metapyroxenite are in close spatial association with the peridotite occurrences described above, which lie at the periphery of the Whitney Lake intrusions. As shown in Figures 3 and 4 the metapyroxenites occur for the most part at least inwards from the peridotite.

In the metapyroxenites hornblende phenocrysts with conspicuous cleavages form from a few to nearly 100 percent of

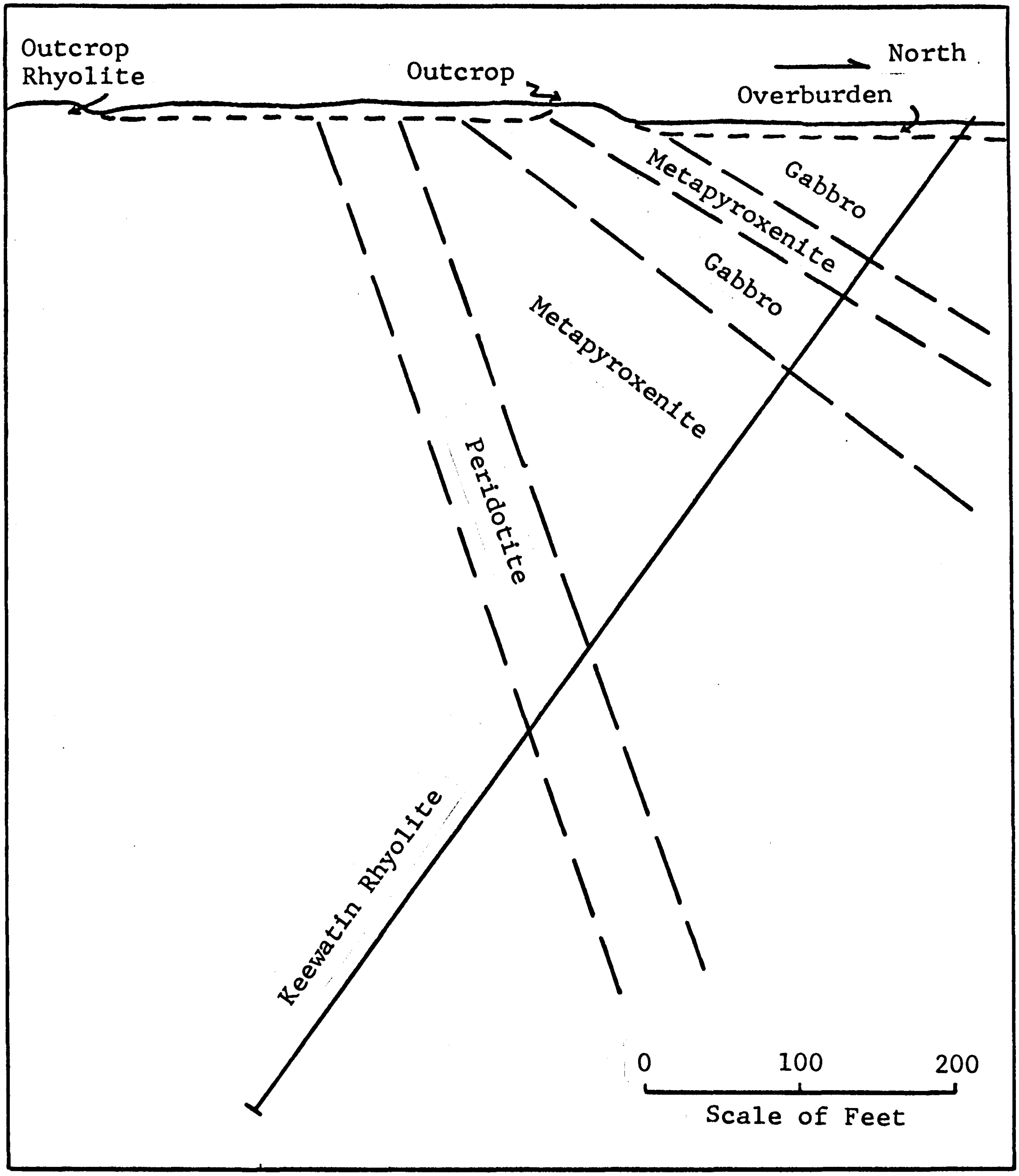

Figure 3. Vertical geological section along drill hole NR6, Nickel Rim Mines Ltd. Group, Block 90, Gillies Limit township.

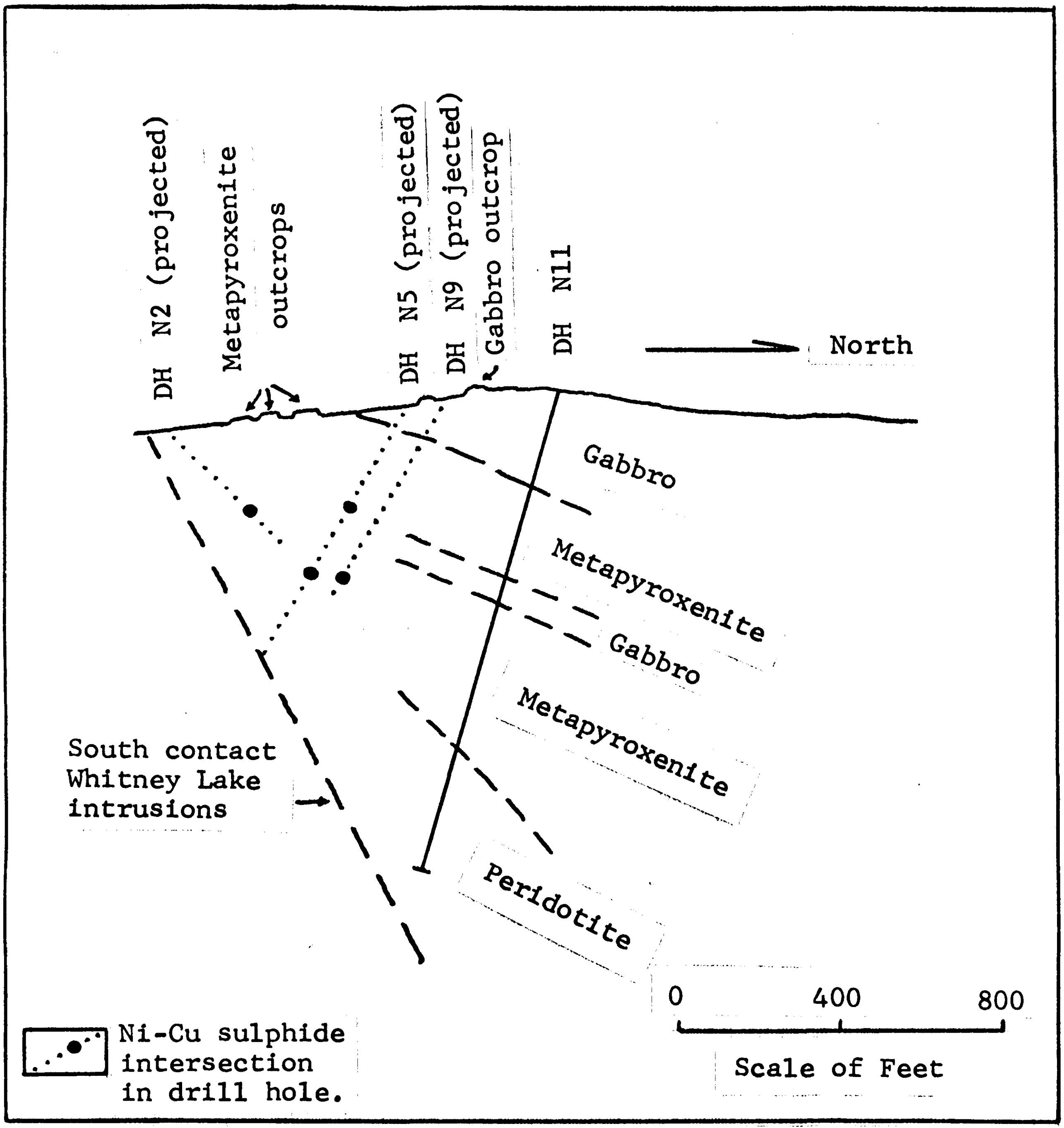

Figure 4 Vertical geological section along drill hole N11, Nickel Rim Mines Ltd. Group, Block 91, Gillies Limit township.

the rock; the phenocrysts range in size from about 2 mm. to over 1 cm. The matrix to the hornblende phenocrysts is for the most part fine-grained fibrous amphibole. An example of a metapyroxenite with a low percentage of hornblende phenocrysts outcrops at Localities A-2 and A-3 (Figure 2). Another type of metapyroxenite is made up largely of haphazardly arranged interlacing hornblende crystals somewhat uniform in size (about one by five mm.) Examples of this type may be seen at Locality A-4. In another variety the hornblende crystals (in size up to 2 cm. by 8 mm.), in random orientation, make up most of the rock. Exposures of this may be seen at Locality A-5 about 700 feet south of drill hole N 11.

The amphibole of the metapyroxenites appears to be in part original and in part from the uralitization of pyroxene.

Sulphides, for the most part pyrite, are usually present to the amount of 1 to 2 percent.

The metapyroxenite in places contains greenstone inclusions. These may be seen at Localities A-3 and A-4.

A list of localities (shown in Figure 2) where metapyroxenite has been found is given below.

A-1, Block 83, Gillies Limit, West of Highway 11. Metapyroxenite outcrops. This is immediately south of the peridotite locality P-1.

A-2 Block 90. Metapyroxenite outcrops on the side of the road leading from Highway 11 at Rory Lake to a tourist camp on Rib Lake.

A-3, Block 90. Metapyroxenite is exposed on the sides of Highway 11 about 900 feet south of Rory Lake, that is about 100 feet south of the lumber road going westerly to Dieter Lake.

A-4, Block 90. Metapyroxenite outcrops at about 300 feet southwest of the southwest tip of Rory Lake, that is about 250 feet south of drillhole NR 6. As shown in Figure 3 metapyroxenite, the same as that in the ourcrop, was intersected from footage 116 to 150. From footage 201 to 421 other metapyroxenite was intersected.

A-5, Block 91. Metapyroxenite outcrops north of Dieter Lake and was intersected in drillhole N-11 as shown in Figure 4. Probably many intersections of what the writer terms metapyroxenite were obtained in the numerous drill holes north of Dieter Lake.

A-6, Block 91. Metapyroxenite outcrops about 600 feet north of the west end of Dieter Lake.

Structure:

Information is insufficient to determine precisely the shape and attitude of the body of Whitney Lake intrusions in Block 90 and 91, north of Whitney Lake. A stock-like shape seems to be in accord with most of the available infromation.

R.I. Benner[1], who laid out and supervised the drill programs of Nickel Rim Mining Co., stated that the south contact of the body both north of Dieter Lake and also east of Highway 11 had a dip of about 70°N. This is in accord with the writer's less extensive observations and is shown on Figures 3 and 4. This northerly dip also obtains for Keewatin volcanic rocks, for most of the schistosity and gneissosity in the Keewatin rocks and Whitney Lake intrusions, and for the dip of the mineralized zones north of Dieter Lake and east of Highway 11. The writer regards the Whitney Lake bodies as having been intruded into Keewatin rocks which were later folded and intruded by Algoman batholithic intrusions. This interpretation appears to be broadly the same as that envisioned by Knight (1920, p. 209) for similar intrusive bodies in nearby townships. The Whitney Lake intrusions are intruded by numerous dikes most of whom are thought to be related to the Algoman batholithic intrusive rocks.

The ultramafic rocks at P-6, 7 and 8 and A 3, 4 and 5 lie near the south rim of the body of Whitney Lake intrusions, north of Whitney Lake; this suggests that the similar ultramafic rocks at P-1 to P-5 and A-1, A-2 are also near the outer rim of the mafic intrusive body. If this is correct the extent of

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[1] Personal communications 1964.

the body is fairly well defined except for the west and northwest parts where it is overlain by Cobalt Group sedimentary rocks.

That the ultramafic rocks form a continuous outer rim around the Whitney Lake intrusion appears to be unlikely.

As shown in Figure 3 the metapyroxenites at A-4 (and P-7) lie north of the peridotite that is towards the large area of gabbro in the central part of the intrusion; the same relation is shown on Figure 4 for localities A-5 and P-8. Somewhat incomplete evidence suggests that the gabbro-metapyroxenite contact at A-4 and A-5 dips about 30°N as shown in Figures 3 and 4.

The spatial relations of the gabbro-metapyroxenite-peridotite leave no doubt that they are closely related in origin but no investigation of these relationships was made.

Lamprophyre:

A few lamprophyre dikes found intruding Whitney Lake intrusive rocks have been assigned to the Haileyburian. A biotite lamprophyre dike about 15 feet thick is exposed in an outcrop on the west side of Highway 11 at about 1,800 feet north of Rory Lake. A biotite-hornblende lamprophyre dike intersecting Whitney Lake intrusions was also seen by the author.

Algoman

As shown on geological maps (Ontario Bur. Mines Map 19c and Ontario Dept. Mines Map 35c) a large area of granitic rock extends westerly and southerly from Whitney Lake and occupies parts of Gillies Limit, Best, Banting, Chambers, Strathy and Cassels townships.

The writer follows Todd (1926, p. 89 and 1925, p. 13) in assigning this granitic body, which intrudes Keewatin rocks, to the Algoman.

In this report the writer includes in the Algoman two kinds of dikes (or small intrusives):

1. Relatively fine-grained granitic to dioritic dikes intruding Keewatin or Whitney Lake intrusions that are thought to be apophyses of the granite pluton.
2. Mafic and ultramafic dikes intruding the granitic rocks but thought to be related genetically to them; the magma of these dikes is considered to be a late stage differentiation product of the Algoman batholiths which was finally emplaced in a part of the batholith that had solidified completely.

Granitic rocks are exposed on the west side of Whitney Lake in Gillies Limit Block 91, along Highway 11 south of Ingersoll Lake in Block 97 and in Best township near Granite Lake and along Highway 11 in the south part of the township.

A small inlier of Algoman granite occurs in Block 83, Gillies Limit on the west shore of Bay Lake. Possibly a westerly extension of this is represented by an outcrop of only a few square feet about 450 feet southwest of Highway 11 and about 800 feet north of the southeast corner of Block 83.

Lithology

An exposure in a rock cut on Highway 11 in Block 97, Gillies Limit about 2,600 feet south of the north block boundary shows the granite to be massive, to have a grain size of about 4 mm., and to contain the following minerals in the estimated amounts shown: quartz 40; flesh-coloured orthoclase 40, and grey oligoclase 15 percent. Biotite appears to have been the original mafic mineral, but represented now by chlorite and magnetite. The granite of the inlier on the west shore of Bay Lake in Block 83, as exposed in a rock cut on the Ontario Northland Railway about 2,500 feet north of the south line of the block, is a massive medium to coarse-grained (1-3 mm.) rock with pink unaltered feldspar as the most abundant constituent. A few greenstone inclusions up to 2 inches in size are present.

Dike rocks intersecting Keewatin rocks and believed to be of Algoman age show a wide range in composition. Todd (1926, p. 90) described and gave a chemical analysis of a quartz porphyry dike in Best township on the west side of James Lake near the south end. A felsitic dike which the author assigns to the Algoman is exposed on the east side of Highway 11 at about 1600 feet north of the south line of Block 90. The pink massive rock contains about 80 percent phenocrysts and 20 percent microcrystalline groundmass. The phenocrysts, about 2 mm. in size, are oligoclase, orthoclase, and quartz; a dark mineral, largely biotite, makes up about 5 percent of the rock. The rock is a porphyritic quartz monzonite. Among the dikes assigned to the Algoman by the writer is a massive grey-green fine-grained one transecting an ultramafic Whitney Lake intrusive rock in Nickel Rim Mines Drillhole NR 2 from footages 55 to 63. This rock contains about 40 percent altered plagioclase, about 20 percent quartz and 35 percent hornblende. This rock is a granodiorite. A 12-foot wide hornblendite dike, which the author assigns to the Algoman, intrudes the Algoman granite on the south side of Highway 11 in Cassels township a few feet south of the Best-Cassels township line. The rock is massive and consists almost entirely of 1 mm. euhedral grey-green hornblende crystals, with minor interstital chlorite.

Matachewan

Todd mapped (O.D.M. Map 35c) and described (1926, p. 91) as Matachewan certain diabase dikes near Granite Lake in Best township. These dikes cut the Keewatin and Algoman but not the Huronian formations.

On Figure 1 and also Figure 5 two Matachewan diabase dikes are shown in Best township near Highway 11. One of these is well exposed on the east side of Highway 11 opposite the Department of Highways of Ontario campsite at Granite Lake. This dike has been traced along a general northerly strike for more than a mile. The dip is nearly vertical. Owing to alteration the dike rock may be called a metadiabase. The grey-green rock is massive with a grain size of 1 to 2 mm. Although considerably altered the original ophitic texture is largely retained. The feldspar, presumably originally labradorite, is for the most part altered to zoisite, white mica and albite. The original pyroxene is completely altered to amphibole in which minor amounts of chlorite and calcite have formed. Quartz is present in minor amount. The Matachewan dikes in the map-area differ from those in the Matchewan area in being more highly altered and in lacking altered plagioclase phenocrysts.

Proterozoic

Huronian Cobalt Group

The Huronian sediments in the Cobalt area were mapped and described under the designation Cobalt Series by Miller (1910, p. 48). For the same area the present writer suggested a division of the Series (more properly termed a Group) into three formations (Thomson 1957, p. 40-42); the Gowganda Formation, defined by Collins (1917, p. 63) as the bottom formation of the Cobalt Group, was divided by the present author into two formations (see Table 1).

TABLE 1 Cobalt Group, division into formations

THOMSON 1957	COLLINS 1917
Lorrain Formation Arkose, quartzite	Lorrain Formation
Firstbrook Formation Argillite	Gowganda Formation
Coleman Formation Conglomerate, Bedded greywacke, Quartzite.	

Cobalt Group sediments, including both Coleman and

Firstbrook formations, are present in the map-area. The sediments are present on both sides of Highway 11 in Blocks 83 and 84, Gillies Limit and extend southerly from here east of the highway to Strathy township. In the north part of the map-area, i.e. in Gillies Limit Blocks 83, 84, 90 and 95 the Cobalt Group sediments are gently dipping. For instance the Firstbrook argillite in Block 94 by the side of Highway 11 dips 7°E. At places in Block 97 and in Best township dips of Coleman Formation sediments are vertical and it is inferred that these steep dips are restricted to the proximity of faults.

Coleman Formation

All the Cobalt Group sediments in the map-area except part of those in Blocks 83 and 84 are of the Coleman Formation. The Coleman Formation in the map-area consists for the most part of conglomerate but arkose is also present.

A good example of Coleman conglomerate is an exposure on the side of Highway 11 about 3,000 feet north of Rory Lake. The Coleman conglomerate shows great variation over short distances in the amount and size of contained boulders. Some exposures of conglomerate along the Ontario Northland Railway in Block 83, Gillies Limit contain unsorted boulders to 1¼ feet in size and making up about 8 percent of the rock; in other exposures boulders make up 50 percent of the rock; in places bedding is well developed.

In many exposures in Block 97 and in Best township bedding is absent or very obscure. This makes determination of the attitude of the formation very difficult. This near absence of bedding in the conglomerate of the area mapped distinguishes it from much of the conglomerate near Cobalt where bedding is usually present.

The bottom contact of the Coleman Formation is exposed in Block 83 Gillies Limit about 900 feet north of the southwest corner and about 350 feet southwest of Highway 11. The Coleman Formation here overlies fine-grained granite and is in sharp contact with it; the bottom 5 feet of the formation is a breccia containing very angular unsorted granite boulders (very similar to the granite below the contact) in a dark greenish matrix. Such breccias at the base of the Coleman Formation are of common occurrence in the vicinity of Cobalt. The thickness of the Coleman Formation in the map-area is probably only a few hundred feet. The greatest thickness in the vicinity of Cobalt is about 800 feet.

A glacial origin is usually ascribed to the Coleman conglomerate and it has been described as the Gowganda tillite. The near absence of bedding in the present map-area appears to signify that deposition did not take place under water.

Firstbrook Formation

Firstbrook Formation sediments are exposed by the side of Highway No. 11 in Block 83, Gillies Limit. The formation is made up almost exclusively of well-bedded argillite. The beds range in thickness from 0.1 to 5 mm. Red-brown or grey-brown beds alternate with grey, grey-green, or greenish ones. The Firstbrook argillite has a distinctive appearance.

In the map-area only the bottom few hundred feet of the formation is present. The greatest thickness known for this formation anywhere is 2,032 feet as shown by a drill hole in Henwood township (about 20 miles northwest of Cobalt); this was the total thickness at that place.

Keweenawan

The diabasic intrusions younger than Huronian rocks are classified as Keweenawan. The intrusions are further classified on the basis of shape and also on the time of intrusion as: (1) Nipissing diabase occurring in sheet or sill-like form with generally low dips, and (2) Keweenawan diabase dikes, which where they intersect Nipissing diabase have chilled contacts against it.

Both Nipissing diabase and Keweenawan diabase dikes are present in the map-area.

Nipissing diabase, as shown in Figure 1, is exposed in

Best township at the south end of Rib Lake. The contact striking south from about the middle of the south end of Rib Lake is thought to be the bottom contact of a sill-like body although it was not seen directly. The inferred easterly dip of this contact if similar to analogous dips in the vicinity of Cobalt might be expected to be between 5 and 30 degrees.

A Keweenawan diabase dike is well exposed in a rock cut on Highway 11 (between Ingersoll and James lakes) in Block 97, Gillies Limit. The dike, about 125 feet wide, strikes N55°W. and dips nearly vertically. Labradorite phenocrysts to 1½ inches long are present but their distribution throughout the dike is not uniform. The composition as shown by thin section is: labradorite 50, pale purplish augite 23, unaltered olivine 23, biotite and magnetite-ilmenite 4 percent. All the minerals in the rock are fresh.

Other narrow Keweenawan diabase dikes were seen in the south part of the map-area. The unaltered, black, fine-grained, massive diabase of the narrow dikes is distinctive in appearance; the dikes seen have northwest strikes and nearly vertical dips. An olivine diabase dike, about 36 feet wide, striking N40°W was intersected by Huclif Porcupine Drillhole 3 on the west side of the southeast arm of Granite Lake on what was formerly claim T.31703 (see Figure 5).

CENOZOIC

Pleistocene and Recent

The important feature of Pleistocene time in the map-area was glaciation. Evidence for this glaciation is the smoothed and striated bedrock surfaces and the abundant presence of till. Field data indicate there was only one period of glaciation, presumably the Wisconsin, the last of the great continental ice sheets of the Pleistocene.

The direction of glacial movement as shown by striae is between S50°E and S10°W. Following the northerly withdrawal of the ice front the map-area was not submerged under a post-glacial lake such as occurred just north of Cobalt, and in such a widespread fashion over much of northern Ontario. At some time following withdrawal of the ice front a spillway for water released by the melting ice followed the present day position of Rib and Petraut lakes. The course of the spillway is indicated by glaciofluvial deposits. The most abundantly occurring glacial deposit in the map-area is till. The sand, gravel, and cobbles along Rib Lake and Petraut Creek in Best township are of glaciofluvial origin.

STRUCTURAL GEOLOGY

Information on the structure of the Keewatin and Haileyburian rocks have been given under these headings in the General Geology section. A few general features of the structural geology are dealt with below and evidence of structural disturbance particularly lineaments are mentioned.

The Archean rocks of the map-area, were subjected to earth forces in such fashion that those of surfical origin and originally deposited somewhat horizontally are presently in nearly vertical attitude. The earth forces effecting this deformation were largely tangential to the earth's crust. Since Archean time the rocks in the map area have not been folded. They have been faulted no doubt at different periods in Proterozoic and more recent time and have undergone general vertical movements.

Linear topographic features (lineaments) commonly furnish the first intimation of the presence of faults; usually the testing needed to confirm the intimation is incomplete. Although evidence that faulting has occurred may be convincing, resolution of the faulting into displacements, direction of movements, or determination of the time or times at which these movements took place is usually not possible.

In the map-area the more important lineaments that may be faults are mentioned below:

Rib Lake Creek Lineament

The topographic depression followed by Rib Lake Creek is thought to mark the position of an important fault striking northeasterly and dipping steeply to the northwest. The southwesterly extension of this fault, or one strand of it, beyond Granite Lake Creek (see Figure 5) crosses Highway 11 about 2,000 feet southwest of the bridge over Granite Lake Creek. Schisting and fracturing in granite are exposed on both sides of Highway 11; fractures striking about N70°E. and with N. dips from 40 to 70° may be seen. The faulting is younger than the Matachewan diabase dikes. On the west side of the Ontario Northland Railway at about 1,500 feet north of Granite Lake Creek is an exposure of much fractured rock with NE fractures dipping 60-65°N. Northerly from here marked fracturing is exposed in the rocks along the railway as far as Rib Lake. East of Rib Lake Creek which lies on the east side of the railway are Huronian sediments; the author suggests that the west contact of the Huronian sediments is a fault along Rib Lake Creek lineament.

Other lineaments

A lineament is a general northeasterly direction passes through the northwest end of Petraut Lake in Best township.

West of Petraut Lake the lineament strikes a few degrees north of east; east of Petraut Lake the strike is northeasterly. West of Petraut Lake the lineament follows a fault, which is exposed in the Danlou pit (see Figure 5). Directly north of Petraut Lake the loneament is the steep westerly-facing edge of a hill of Huronian sediments. The presence of a well marked schistosity, striking N15°E and dipping 70°W, and of vertically dipping beds in the sediments suggests that the lineament follows a post-Huronian fault.

Several lineaments are present near Dieter Lake, Block 91, Gillies Limit. About 400 feet northwest of the west end of Dieter Lake a conspicuous east-facing scarp of Cobalt Group sediments trends N25°E. Along Dieter Lake Creek a well marked lineament trends north. This was interpreted to follow a fault by Dunn (P.E. Hopkins Group, Assessment Work Reports), who regarded the lineament along Dieter Lake (at about N75°W) to follow a fault also.

ECONOMIC GEOLOGY

At present there is no productive mine in the map-area; the only former producer was the Northland Pyrites mine (in Best township at the southwest corner of James Lake) which produced in a small way between 1906 and 1911.

Occurrences of minerals containing the following metals have been found: cobalt-silver, copper, gold, molybdenum, nickel, platinum.

To date metallic mineral deposits have been of most interest; industrial minerals present include pyrite, sand-gravel and silica.

Most of the properties, claim group, and occurrences mentioned under the various metals and industrial minerals in what follows are described more fully in a later part of the report under "Description of Properties and Occurrences".

Metalliferous Deposits

Cobalt-Silver

One cobalt-bearing vein, with insignificant amounts of silver, the WKT cobalt occurrence, is present in the map-area in Best township.

The map-area is within the Timiskaming silver-cobalt area and about ten miles west of the formerly important Frontier and Keeley silver mines in South Lorrain.

Copper

The writer assigns the copper occurrences in the map-area to three types:

1. <u>Nickel-copper in association with mafic and ultramafic</u>

<u>intrusions</u>: The only deposits of this type in the map-area are those near Whitney Lake investigated particularly by Nickel Rim Mines Ltd.

2. <u>Copper-nickel in pyrrhotite-chalcopyrite-pyrite mineralization along fractured and sheared zones in Keewatin rocks</u>: The sulphides, pyrrhotite, chalcopyrite, pyrite, range from a few percent as disseminated grains to nearly 100 percent; the massive sulphides occur as bands up to three feet wide, or as irregular to vein-like shapes in the dark green altered host rock. Variation in the amount of sulphides along the strike of the fractured and sheared zones is marked. Pyrrhotite is the most abundant sulphide but in places chalcopyrite is predominant. So far as known chalcopyrite is the only copper-bearing mineral present. The presence of nickel is shown by assay returns. Pyrrhotite or pyrite-pyrrhotite mineralization in the map-area may contain little or no nickel. Zinc blende and galena are present in places but so far as known in insignificant amount. Among the highest assay returns of which the writer has record are those obtained at the No. 2 Acana occurrence, Best township. Assay returns of 0.69 percent copper and 1.14 percent nickel across 23.0 feet were reported (Reef Explorations Ltd. Assessment Work Reports Best township). Most of the assay returns available to the writer from samples taken from diamond drill core obtained in the

drilling of occurrences of this type are very much lower and distinctly below ore grade.

The presence of platinum group metals has been reported and at one place, the No. 5 Acana showing, this was confirmed by the writer. Altered dark green country rock is the most abundant gangue. Carbonate and quartz are present in minor amount.

The deposits are in fractured and sheared zones up to 12 feet wide and up to at least 400 feet in length.

Some of the occurrences are along or in Matachewan diabase dikes, showing that the age of the deposits is post-Matachewan. The occurrences of this type in the map-area are for the most part those in the claim group formerly held by Acana Mines Ltd. near Granite Lake in Best township.

Included in this type is chalcopyrite-pyrite (without pyrrhotite) mineralization along fractured or sheared zones in Keewatin rocks. The H. Niemetz copper occurrence, Best township, is an example.

3. <u>Copper in gently dipping quartz veins younger than Huronian</u>: Two copper occurrences in the map-area are assigned to this type. J. Sutherland copper occurrence on claim T.27817, in Block 95, Gillies Limit and the N. McLean copper occurrence in Best township about ¼ mile south of Rib Lake. Characteristics

of the type include (1) presence of chalcopyrite as the copper-bearing mineral (2) quartz gangue (3) vein dips usually less than 30^{o}.

Deposits of this type are known at several places in the vicinity of Cobalt and of Timagami but to date none has developed into a productive mine. Two deposits, representative of the type, away from the map-area, are: (1) Van Chester Vein No. 3 (near Cobalt) in lot 15, concession III, Coleman township. Quartz veins containing chalcopyrite and minor amounts of galena and sphalerite are contained in Nipissing diabase and in Firstbrook Formation sediments. The veins are near the contact between the two, (Thomson 1960, p. 9, 10). (2) New Delhi Mines Ltd. vein system in Delhi township about 23 miles west of Timagami (Lawton 1954, p. 15, 16).

The quartz vein described by Todd (1926,p. 101) intersecting Nipissing diabase at Thieving Bear Lake in the western part of Best township, also outside the map-area, is probably of this type.

Gold

The only occurrence reported in the map-area is that on the property of Danlou Mines Ltd. in Best township about 300 feet south of Highway 11 at 2,000 feet southwest of the bridge over Granite Lake Creek. The occurrence is in a quartz vein in a schisted zone; pyrite-chalcopyrite is present in small amount.

Molybdenum

Several occurrences of molybdenite are known in the map-area but as far as the author knows none is of economic significance.

The Guppy molybdenite occurrences, south of Granite Lake in Best township, are in Keewatin lavas and associated minor intrusives adjacent to large granitic areas. The molybdenite is in quartz veins, along minor shears in the Keewatin rocks or in feldspathic dikelets.

The Mortimer C molybdenite occurrence is situated on the claim west of the former Guppy claims.

Other occurrences in the map-area are within and in the wall rock of quartz veins traversing granites. One such occurrence in Block 97, Gillies Limit is a 3-inch quartz vein containing molybdenite and chalcopyrite exposed in the rock cut on Highway 11 about 20 feet north of the Keweenawan diabase dike on the west side of the highway. About 35 feet south of the dike on the east side of the highway molybdenite is present in a one-inch quartz vein, and is disseminated as flakes up to 1/10 inch across in the granite up to 8 inches from the vein.

The most important molybdenite occurrence known to date adjacent to the map-area is that of Myteque Mines Ltd. in Strathy township to the south; a small production was obtained from this property many years ago. The molybdenite is in quartz veins and to a smaller extent in the wall rock. The occurrence is in Keewatin volcanics near large granitic intrusions. The property is on the west shore of Net Lake about 4 miles north of Timagami station. Under its former names, Net Lake (Barton) property it has been described by Vokes (1963, p. 99-101).

Nickel

In the map-area nickel occurs in the nickel-copper deposits associated with mafic and ultramafic intrusions and also in the copper-nickel deposits of pyrrhotite-chalcopyrite-pyrite mineralization along fractured and sheared zones in Keewatin rocks (see p. 38).

Platinum

In the map-area platinum has been found in copper-nickel deposits of pyrrhotite-chalcopyrite-pyrite mineralization along fractured and sheared zones in Keewatin rocks (see p. 39).

Sulphide Mineralization

In this report the designation " sulphide mineralization" is used for minor occurrences of pyrite and pyrrhotite which are unaccompanied, so far as tested to date, by copper, lead, or zinc minerals in significant amount.

Such sulphide mineralization accompanied by small quartz veins is reported (J. Sutherland claim T.26934, Assessment

Work Drill logs Block 95, Gillies Limit) in Keewatin tuffs in the southwest corner of claim T.26934 in Block 95, Gillies Limit. The occurrence in Drillhole No. 4 of 22 feet of white, grey, or dark grey tuff containing about 4 percent pyrite in irregular disseminations appears to be representative of the occurrence. A few grains of sphalerite, galena, and chalcopyrite are present in the drill core.

Quartz Veins

Quartz veins up to 6 inches wide intersect fine-grained granite in the outcrop area of this rock in Block 93, Gillies Limit on the west shore of Rib Lake. Those examined by the writer did not contain metallic minerals but were similar to others in the map-area containing molybdenite.

Industrial Minerals

Industrial minerals occurring in significant amount in the map-area include flagstone; pyrite; sand, gravel and ballast; silica.

Flagstone

The Firstbrook argillite, in Block 94, Gillies Limit may possibly be considered a potential source of flagstone; similar material is used for this purpose in the town of Haileybury.

A minor amount of testing work was carried out in 1967 on Firstbrook argillite ourcropping on the east side of Highway 11 a short distance north of the map-area.

Pyrite

The only known occurrence of pyrite in significant amount in the map-area is at the Northland Pyrites mine at the southwest end of James Lake in Best township.

Sand, Gravel, and Ballast

Pits have been opened at several localities in the glaciofluvial deposits exposed at intervals on the west side of Rib Lake and southerly from it to Petraut Lake. Several pits are near the north end of Petraut Lake, and one is near Rib Lake at about the middle of Block 83, Gillies Limit.

Silica

A small production of silica, used as a flux in smelting, was formerly obtained from what the author designates as the Cuniptau silica deposit, situated in Best township on the east side of Highway 11 about 2,000 feet south of Granite Lake.

DESCRIPTION OF PROPERTIES AND OCCURRENCES

Acana Mines Limited (circa 1952)

Acana Mines Ltd. at present owns no claims in the map-area; in 1952 they held a group of 15 unsurveyed claims on both sides of Highway 11 near Granite Lake, Best township.

In this report the group is treated as a unit, regardless of present ownership, for descriptive purposes.

History and Development

Before 1952 separate claims in the group had passed through several owners, who had carried out surface prospecting at intervals over a period of at least 25 years. The prospecting included trenching and sinking pits, one of which, at the Acana No. 2 showing, was 35 feet deep.

In this early work occurrences of copper, nickel and silica were discovered but little information is available to the author on who did the work or the nature of the results obtained.

In 1936 a silica deposit (see Figure 5, claims T.33189 and T.33216) produced a small tonnage of silica for use in the Cuniptau smelter situated in Strathy township. Since 1952 separate claims have also passed through several owners.

In this report a description of the showings on the group and of work done on them to the present is given. On Figure 5 most of the diamond drilling done to date is shown. Separate mention of the present owners of claims in the group is made also.

Acana Mines Ltd. acquired control in 1952 of the group from N.H. McLean, prospector. In late 1952 Acana Mines Ltd.

had electrical resistivity and magnetic surveys made of the group and later a geological survey (Acana Mines Ltd. Assessment Work Reports, Best township). Figure 5 is a geological map of the group slightly modified from one prepared by Geo-Technical Development Co. Ltd., November 1952, for Acana Mines Ltd. with additions by the writer. In a geological report to Acana Mines Ltd., McCannell (Acana Mines Ltd. Assessment Works Reports,Best township) assigned numbers 1 to 10 to economic occurrences in the group; it is convenient to retain these designations as e.g. No. 2 showing of Acana Mines since they have been worked on by several companies.

In 1953 Cheskirk Mines Ltd. took a working option on the group and 8 diamond drill holes, totalling 2,264 feet were drilled; following this the option was dropped. The positions of drillholes are shown in Figure 5; a report to the company on the drilling by A.W. Stollery, who had supervised the drilling, was kindly made available to the Ontario Dept. of Mines (Cheskirk Mines Ltd. Company Report, Best township).

In 1954 nine diamond drillholes were put down on the group by Quebec Metallurgical Industries Ltd. The positions of the drillholes are shown in Figure 5 on claims designated T.31210, T.31459 and T.31704 and assessment work, work drill logs are available (Koza-McLean, Assessment Work Reports, Best township).

In 1956 Central Milner Mines Ltd. drilled two holes near Acana showing No. 2 in claim T.31459; the approximate positions of the holes are shown in Figure 5 and assessment work drill logs are available (Central Milner Ltd., Best township group, Assessment Work drill logs, Best township).

In 1957 Huclif Porcupine Mines Ltd. carried out a minor amount of surface work and drilled 4 drillholes. Two positions of the drill holes are shown in Figure 5 (on claims designated T.31703 and T.31705) and assessment work drill logs are available (Huclif Mines Ltd. Granite Lake property, Assessment Work, Best township).

In 1957 that part of Figure 5 designated T.31459, T.31210, T.31197 and 33218 was part of the Copper-Nickel Group (26 claims) of Reef Explorations Ltd. and was investigated by an electromagnetic survey. Later work was carried out particularly in the vicinity of Acana showing No. 2 in claim T.31459 and included four trenches and seven drill holes. Reports on the electromagnetic survey, the trenching, and the drilling were submitted to the Ontario Dept. of Mines for assessment work (Reef Explorations Ltd., Assessment Work Reports, Best township).

In 1960 a drillhole, whose approximate position is shown in Figure 5, was put down on claim T.46975 (formerly T.31704). A log of this hole is available (T.46975, Assessment Work Report, Best township).

In 1961 Danlou Mines Ltd. carried out a small amount of trenching and drilled three holes on a gold-bearing vein shown in Figure 5 on claims T.33189 and T.33216. Logs of the holes are available (Danlou Mines Ltd., Prospectus, etc., Best township).

In 1961 that part (approximately) of Figure 5 designated as claims T.31703, T.31704 and T.31705 (southwest of Granite Lake) were part of the Guppy group. Interest was particularly in molybdenite occurrences which apparently had been discovered during the construction of the gas pipe line southwesterly from Granite Lake.

In 1965 what was termed the Dunmor property (16 claims held under option by Ajax Minerals Ltd.) included what is shown as claims T.31210, T.31197, T.33218, T.31459, T.31704, T31703 and T31705 on Figure 5. A magnetometer survey and an electromagnetic survey were made over the area included in the claims listed above and other parts of the Dunmor property. An induced polarization and resistivity survey was made over a small part of the area covered by the other surveys. A report on these surveys is on file (Ajax Mines Ltd., Dunmor property company report, Best township). The option was dropped in 1965.

In 1966 that part of Figure 5 designated T.31210, T.31197, T.31459, and T.33218 was part of the Niemetz-Dunlop group of

13 claims. In that year a magnetometer, a self potential and a geological survey of the group was made by Geophysical Engineering and Surveys Ltd. A report covering these surveys is available (Niemetz-Dunlop group, Assessment Work Report, Best township). No work has been done on the group since then.

Showings

The Acana Mines Ltd. Showings Nos. 1 to 10 are of the "copper-nickel in pyrrhotite, chalcopyrite, pyrite mineralization" type mentioned previously.

Showing No. 1 is in claim T.31210 (see Figure 5), on the east side of a topographic depression. Chalcopyrite, pyrite, and pyrrhotite make up to 50 percent of widths to 3 feet along the 25 feet of exposure in a shallow trench. The mineralization is in a shear zone striking N, and dipping 75°W.

Showing No. 2 is in claim T.31459 (see Figure 5); this claim occupies approximately the same position as former claim JS 59. The showing has given the highest sampling results and has had more work done on it than any other on the property. Chalcopyrite, pyrite and pyrrhotite mineralization occurs in a sheared zone along a contact between gabbroic rocks to the east and volcanics to the west. The showing had been explored by a 35-foot pit which had been excavated many years before.

Assay returns from samples taken at the pit and nearby trenches were encouraging but not those from the drillhole samples. Reef ExplorationsLtd. reported (Reef Explorations Ltd., Assessment Work Reports, Best township) that an exposure of sulphides in the 35-foot pit assayed 1.55 percent nickel and 0.84 percent copper across 3.0 feet. In the trench 50 feet from the pit and designated RE on Figure 5 assay returns of 0.55 percent copper and 0.32 nickel across 25 feet were reported. In the trench 90 feet from the pit and designated RE 2 on Figure 5 assay returns of 0.69 percent copper and 1.14 percent nickel across 23 feet were reported.

Showing No. 3 (in the northeast corner of claim T.31459) was exposed by a pit about 15 feet deep. On the dump of the pit pyrite, pyrrhotite and chalcopyrite is present both as heavy and as disseminated mineralization; galena and dark sphalerite are present in minor amount.

Showing No. 4 (in claim T.31459) appears to be on the southerly extension of Showing No. 2.

Showing No. 5 (in claim T.31705) is a mineral-bearing shear along the contact of a Matachewan diabase dike. Chalcopyrite, pyrite, and pyrrhotite are contained. The presence of nickel and platinum group metals is reported (Acana Mines Ltd. Assessment Work Reports, Best township). The assay returns of a selected sample taken by the writer and assayed by the Laboratory Branch, Ontario Dept. of Mines, gave an assay return of 0.04 oz. platinum per ton and 0.08 oz. palladium per ton. Presumably the platinum group metals are not distributed uniformly; local prospectors have reported obtaining assay returns of platinum group metals over 1 oz. per ton from this showing.

Showing No. 6 (in claim T.31703) is a fractured and sheared altered diabasic rock containing chalcopyrite, pyrite and pyrrhotite. This showing was tested by Cheskirk Mines Ltd. drillhole C-4. Sampling of what was regarded as the downward extension of the showing between footage 194.1 and 196.8 in the drillhole was reported (Cheskirk Mines Ltd. Company Report) to give assay returns as follows: copper 0.29 percent, nickel 0.22 percent, cobalt 0.038 percent, gold 0.005 oz. per ton, silver 0.15 oz. per ton, and platinum trace.

Showing Nos. 7 and 8 (in claim T.31703) are sulphide-bearing shears in volcanic rocks.

Showing No. 9 (in claim TRT.6904) is a sulphide-bearing shear in volcanic rocks.

Showing No. 10 in claim TRT.5165 is reported by McCannell (Acana Mines Ltd. Assessment Work Reports, Best township) to be a silicified shear, in dacitic tuffs with some pyrite, pyrrhotite and minor chalcopyrite.

Some drilling done on the Acana Mines Ltd. group other than that mentioned above was based on anomalies disclosed by the Acana Mines Ltd. geophysical surveys. Drillholes KM-7 and KM-8 on the west side of claim T.31459 were drilled by Quebec Metallurgical Industries Ltd. for this reason.

Cuniptau Silica Occurrence

A silica occurrence (see Figure 5 on claims T.33189 and T.33216) produced in 1936 a small tonnage used for flux at the Cuniptau smelter.

The occurrence is a siliceous replacement of granite, with accompanying quartz veins, along a fractured zone. Enrichment in silica is present in a zone about 1,700 feet long and up to 125 feet wide. The occurrence is on a hill up to about 60 feet high immediately southeast of Highway 11. Despite variations in the amount of silica at different places in the occurrence the author had an analysis made on one block which he considered representative of the deposit. The results of the analysis, made by the Laboratory Branch, Ontario Dept. Mines, are as follows:

	percent
Silica	97.91
Alumina	0.54
Iron	0.20
Lime	0.02
Magnesia	0.13
Soda	$<$ 0.10
Potash	$<$ 0.50

The sample was mottled reddish white in colour with the reddish parts being incompletely replaced granite. A minor amount of rust is present at outcrop surface, presumably from the oxidation of pyrite occurring in very small amount.

Danlou Mines Ltd.

Danlou Mines Ltd. held in 1961 seven unpatented claims (Danlou Mines Ltd. Prospectus dated 12 July, 1961, Best township) in Best township along Highway 11, about one quarter mile southwest of Granite Lake.

S.L. MacDonald, consultant for the company, reported (Danlou Mines Ltd. Prospectus, etc.) that a sample from a pit (designated "Danlou Pit" on Figure 5) gave an assay return of 5.9 oz. silver and 0.73 oz. gold per ton.

The pit was reported to be 10 feet deep and to expose quartz veins to a width of 30 inches enclosed in schist; pyrite-chalcopyrite mineralization is present. The schist and veins strike N80°E and dip 70°N. The schist is along a fault which is post-Matachewan in age. Extensions of the quartz and schist in the pit were explored by a minor amount of rock trenching and three drill holes shown in Figure 5. M. Ogden (Danlou Mines Ltd., Assessment Work Reports, Best township) reported that assay returns of samples from the drill holes were nil or trace. Sampling of the Danlou pit gave an assay return of 0.18 oz. gold over a width of 18 inches. Work was stopped in 1961.

A. Dunlop Group

In 1967, the group consisted of four unpatented claims T.58984, T.58985, 6 and 7, whose positions correspond approximately to claims T.31210, T.31197, T.33218, and T.31495 shown in Figure 5. A description of the mineral occurrences on the property is given under the heading "Acana Mines Ltd. Showings".

Guppy Molybdenite Occurrences on Claim T.31704

A. Guppy of Timagami in 1961 brought to the writer's attention occurrences of molybdenite along the Trans Canada Pipe Lines Ltd. gas pipeline on claim T.50636, which had approximately the same position as claim T.31704, shown in Figure 5, southwest of Granite Lake.

The molybdenite occurs (1) in quartz veinlets, up to an inch wide, traversing Keewatin volcanics and altered mafic intrusive rocks; (2) as films about 1/40 inch thick and over about 3 square inches along slips in Keewatin volcanics and altered mafic intrusive rocks; (3) in red feldspathic veinlets accompanied by chalcopyrite and pyrite in minor amount. Axinite is present in one such veinlet on the west side of the gas pipeline about 130 feet due south of the northeast corner of claim T.31704. The feldspathic veinlets contain epidote and in places small amounts of white calcite. In some places the molybdenite is accompanied by powellite, which, under ultraviolet light, gives its characteristic and conspicuous yellow fluorescence.

The molybdenite occurrences along the pipeline are in Keewatin volcanics and mafic intrusives in proximity (within a quarter mile) to large granitic area.

None of the occurrences visited by the writer were rich enough or large enough to be ore; they do however indicate the widespread occurrence of molybdenite.

Molybdenite Occurrence On Claim TRT.5165

On the west side of Highway 11 opposite the tourist camp on TRT.5165 (see Figure 5) a quartz vein one to 3 inches wide, containing molybdenite, pyrite, and chalcopyrite, traverses Keewatin andesitic lava.

Crowpat Minerals Limited, Gillies Limit

In 1956 Crowpat Minerals Ltd., who held a group of 17 claims in Blocks 83, 84, 90 and 91, Gillies Limit, drilled 17 drillholes (see Figure 2) on claim T.37251, Block 84 (Crowpat Minerals Ltd. Assessment Work Reports, Gillies Limit township Block 84). The longest drillhole was 58 feet, most of the others were 26 feet. In the assessment work drill logs there is no record of any mineralization.

N. McLean, Copper Occurrence, Best Township

This occurrence is in Best township about one quarter mile south of the southwest end of Rib Lake. The occurrence consists of a number of veins up to 7 inches wide intersecting Coleman Formation conglomerate; one vein strikes N5°W, and dips 45°E. The veins are largely quartz, with minor amounts of red feldspar, white calcite, epidote and deep green chlorite; chalcopyrite, in irregular splashes, and pyrite are present. Where exposed the veins appeared to contain too little chalcopyrite to be of economic importance. At the time of the writer's visit (1965) the WKT Mining and Exploration Co. had put down three shallow diamond drill holes to explore the occurrence.

C. Mortimer Molybdenite Occurrence, Best Township

A molybdenite occurrence (not visited by the writer) was reported (C. Mortimer property, Assessment Work drill logs, Best township) on claim T.57584, which is west and contiguous with the claim designated T.31705 on Figure 5. The occurrence, about 450 feet south and 600 feet west of the northeast corner of the claim, is reported to be in granite.

Nickel Rim Mines Ltd.

Since the description below was written Nickel Rim Mines Ltd. have relinquished all but seven of the claims; unpatented claim T.53537 (east of Highway 11 and west of Claim T.32553) was retained.

The property consisted of 28 unpatented claims in Blocks 83, 84, 90, 91, 95 and 96 Gillies Limit; most of the property is shown on Figure 2 of this report. The property was for the most part on the north side of Whitney Lake and was crossed by Highway 11.

Nickel-copper occurrences of economic interest have been investigated at two places particularly: (a) near the east end of Dieter Lake in Block 90; (b) on unpatented claim T.53537 east of Highway 11 and west of claim T.32553.

History

George Byles[1] prospector and developer, Haileybury, told the writer that the first discovery on the property was made by a prospector in the 1940's. A chalcopyrite occurrence was found near Dieter Lake but the discoverer was unable to retrace his steps to his discovery.

In 1952 Rib Lake Copper Mines Ltd. (Rib Lake Copper Mines Ltd. Assessment Drill Reports, Gillies Limit) carried out a diamond drill program on the claim (now owned by Nickel Rim Mines Ltd.) west of T.32553, (see Figure 2) and T. 32553. Presumably the drill campaign was based on some kind of

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[1] Personal communication 1965.

geophysical survey but the writer has no information on this.

About 1955 sulphide boulders carrying copper and nickel were discovered by N. Montgomery, prospector, a few hundred feet east of Dieter Lake (see Figure 2).

In 1955 and 1956 Coniagas Mines Ltd. held an option on the Montgomery group of 44 claims which occupied somewhat the same area as the present property of Nickel Rim Mines Ltd. Most of the prospecting of Coniagas Mines Ltd. was carried out in the vicinity of Dieter Lake. A magnetometer survey (Coniagas Mines Ltd. Assessment Work Report, Gillies Limit, Block 91) was made of an area of about 80 acres. This was followed by a diamond drilling campaign of 5 holes (Coniagas Mines Ltd. Assessment Work Report, Gillies Limit, Block 91). In 1956 Crowpat Minerals Ltd. (Assessment Work Report, Gillies Limit, Block 84) put down 17 short (26 to 58 feet) drill holes on a claim on ground later included in Nickel Rim Mines Ltd. holdings. The approximate location of the drill holes is shown in Figure 2.

In 1957 most (36 claims) of the Montgomery group were optioned by P.E. Hopkins. A magnetometer survey, an electromagnetic survey, and a geological survey were carried out (P.E. Hopkins Group, Assessment Work Reports, Gillies Limit, Block 91).

About 1963 C.N. Niemetz staked many of the claims formerly belonging to Rib Lake Copper Mines Ltd. and also to P.E. Hopkins. Four drill holes (C.H. Niemetz Group, Assessment Work Reports, Gillies Limit, Block 90) were put down.

In 1963 Nickel Rim Mines Ltd., a company sponsored by the firm of Brewis and White, Toronto, took an option on the Niemetz Group and also staked additional claims. Prospecting and exploration was under the overall direction of R.I. Benner. Work done included a photogeological survey, geophysical surveys -- magnetometer, self-potential, ratio-resistivity, and electromagnetic, -- geological work, and diamond drilling. In the period December 1963 to August 1965 Nickel Rim Mines Ltd. (Nickel Rim Mines Ltd., Assessment Drill Reports, Gillies Limit, Block 90) drilled 10 holes in the vicinity of Dieter Lake and nine holes east of Highway 11 and northeast of Whitney Lake. One deep (1,275 feet) hole was drilled near Dieter Lake in the spring of 1967. At present the property is dormant.

The writer is indebted to Nickel Rim Mines Ltd., in particular R.I. Benner, geologist, manager of their operation, for making available much information on the property. He is indebted to D. Burton, geophysicist, for pointing out significant features of the geophysical work.

Description

Nearly all the direct information obtained to date on these deposits has been obtained by diamond drilling. Dunn (P.E. Hopkins Group, Assessment Work Reports 1959, Gillies Limit, Block 91) writing of the sulphide-bearing float found by Montgomery east of Dieter Lake reported, "The seven most significant pieces of float are located within a square of about 400 feet". The approximate position of the float is shown in Figure 2. Dunn reported that nickel-copper-bearing material was obtained in trenching. The present writer saw one pit (shown in Figure 2) about four feet deep just north of Dieter Lake from which pyrite and pyrrhotite-bearing material had been excavated. It appears that exposure of the deposits at surface is small and exposure by excavation very limited.

The metallic minerals of the deposits are sulphides; the non-metallic gangue minerals are largely silicates such as make up the enclosing host rock of the Whitney Lake intrusive rocks. Sulphides present include chalcopyrite, pyrite, pyrrhotite; the presence of pentlandite is inferred from the nickel assay returns. The amount of sulphides present as disseminated grains, as streaks, or as masses ranges up to nearly 100 percent. The sulphides may be almost exclusively pyrrhotite or almost exclusively pyrite; apparently no occurrence rich in chalcopyrite has been found to date. No relationship between nickel content and total amount of sulphides or amount of pyrite or pyrrhotite is apparent. The following excerpts selected from Nickel Rim Mines Ltd. drill logs by R.I. Benner may serve to indicate roughly the extent and tenor of mineralization. From D.H. 3-footages 175.5 to 203.5 - 2 to 3 percent pyrite and pyrrhotite not sampled; footages 203.5 to 205.1 massive, pyrite, pyrrhotite and chalcopyrite - assay return 2.8 oz. per ton silver, 0.32 percent copper, and 1.18 percent nickel (one of the highest nickel assay returns). As indicative of the usual tenor of the sulphide zones intersected by drilling the following excerpt from Benner's log of Drillhole N5 (drilled at -60° against the mineralized zone dipping 72°) is given. In these the abbreviation for pyrite is py, for pyrrhotite po and for chalcopyrite cp; assay returns for gold and silver are in oz. per ton and for copper and nickel in percentages.

FOOTAGES		Au	Ag	Cu	Ni
475.0 - 481.7	2-3% py, po, cp not sampled	-	-	-	-
481.7 - 486.0	15% py, po & cp	0.01	R.	0.33	0.26
486.0 - 488.4	1-2% py, po	0.01	-	-	0.10
488.4 - 493.4	20-25% py, po & cp	0.01	0.8	0.30	0.33
493.4 - 498.5	5% py, po, & cp	0.01	-	0.21	0.10
498.5 - 501.8	15% py, po & cp	Nil	-	0.36	0.37
501.8 - 510	3-5% py, not sampled	-	-	-	-

Nickel and copper in the drill intersections obtained to-date are below ore grade.

The most abundant non-metallic gangue is amphibole not distinguishable from the amphibole in the metapyroxenite of the Whitney Lake intrusive rocks. In places carbonate in quite minor amount is present.

For the most part the sulphide-bearing bodies do not have sharp walls but appear to be merely an increase in amount of sulphide from the approximate ½ percent in disseminated grains present everywhere. In places the sulphides are in streaks along schist surfaces.

Logs of the drill holes record a number of sulphide-bearing intersections but apparently it has not been possible to integrate the drill results to demonstrate the size, shape, or attitude of the bodies giving the intersections. Those drill holes where sulphides in significant amount were intersected are indicated on Figure 2. All the sulphide-bearing intersections found to date appear to be in the area of Whitney Lake intrusions north of Whitney Lake. They are near but not at the periphery of this area. For the occurrences north of Dieter Lake many of the sulphide-bearing intersections are in the amphibolite of the ultramafic rocks of the Whitney Lake intrusions. Benner (Nickel Rim Mines Ltd., Assessment Work Reports, Gillies Limit, Block 90) reports the presence of blue quartz associated with the sulphides in drill intersections; this suggests that the quartz gabbro or uralite quartz gabbro of the Whitney Lake intrusions may also be host rock to sulphide deposits. Dunn (P.E. Hopkins Group, Assessment Work Reports, Gillies Limit, Block 91) reports that "Among the float pieces (of sulphide-bearing material), a diorite with blue quartz eye was found with good disseminations of pyrite".

The extent to which the deposits follow or are associated directly with schisting as opposed to occurring in massive rock does not seem to be known with certainty. D. Burton[1], geophysicist, who carried out some of the magnetic, electromagnetic, and ratio-resistivity work on the property stated this geophysical work indicated one continuous shear zone or similar line of structural disturbance from drill holes N 6 and 7 (north of the west end of Dieter Lake to drill holes NR 1 (east of Highway 11 and north of Whitney Lake).

Type of Deposit

The Nickel Rim Mines Ltd. nickel-copper deposits are of a well known and widely occurring type to which the nickel deposits at Sudbury belong. Important characteristics of the type are: dominance of sulphides in the metallic minerals of the deposits; occurrence of the deposits at and near the periphery of norite and peridotite intrusions. In a recent

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[1] Personal communication 1967.

publication on the nickel deposits of North America Cornwall (1966) gives much information on the type.

An early theory of origin of this type of deposit that furnishes an explanation of certain of its characteristics is that the sulphides were originally dissolved in the magma of the norite-peridotite intrusions; after emplacement of the magma the sulphides plus other constituents precipitated from the magma as a fluid which segregated near the margins of the intrusion. A very lucid exposition of the theory is given in the textbook by Beyschlag, Vogt and Krusch (1914, p. 278-300). They point out that according to the theory large deposits are to be expected only in association with extensive areas of gabbro. It may be mentioned that the area occupied by the Whitney Lake intrusions is fairly extensive. As a modification of the theory it has been suggested that after segregation of the sulphides plus other materials as a fluid these were led to their final place of solidification by channelways furnished by structural features such as faults. This modification is necessitated by the frequent association of the deposits with shear zones and similar structural features.

Prospecting Methods

In the prospecting done to date geophysical methods have been emphasized. The author feels that more extensive geological work would have furnished information helpful in interpreting the geophysical results and in carrying out further prospecting.

Prospecting and development has shown the presence near surface of (below ore grade and not very extensive) copper and nickel deposits. That portion of the property where the peripheral part of the Whitney Lake intrusions forms the bedrock surface has been carefully investigated by geophysical methods to the depths which the geophysical methods used would permit; below this is good prospecting ground although the search would be more difficult and costly. Prospecting those places where the host rocks of the deposits, the peripheral part of the Whitney Lake intrusions, are covered by Huronian rocks would be particularly difficult.

H. Niemetz Copper Occurrence, Best Township

The H. Niemetz copper occurrence is in Best township at the gas pipeline of Trans-Canada Pipe Lines Ltd. and about three hundred feet west of Highway 11. Chalcopyrite-pyrite mineralization is present along a sheared zone about one foot wide and with northwesterly strike. The sheared zone traverses Keewatin pillow lava; chalcopyrite and pyrite are present in the shearing and the adjacent rock; in places quartz and carbonate in minor amount are present. At the time of the writer's visit (1966) preliminary exploration had just started;

two short drill holes were put down in 1967 another drill hole was put down on a somewhat similar occurrence on the east side of Highway 11 at about 700 feet north of the pipeline.

Northland Pyrites Mine, Best Township

The Northland Pyrites mine is situated in Best township at the southwest end of James Lake. The shaft and open cuts are on claim W.D. 404 (T.R.T. 3732) a 66-acre claim. A road from Highway 11 goes to the property except that the bridge over James Lake Creek is out. Fraleck (1907, p. 165) who refers to the mine as the Harris mine, reported that the original discovery was made in 1903, but active development was not started until 1906. From February 1906 until March 1911 the mine was in nearly continuous production. According to an old statement from the office of the traffic accountant, Temiskaming and Northern Ontario Railway, 76,067,050 pounds were shipped during this period. A.A. Cole[1] (deceased) formerly manager of the Temiskaming Testing Laboratories Cobalt, told the writer that closure of the mine, which had been in precarious financial position, was caused by shipment for three days of pyrrhotite instead of pyrite. The pyrrhotite was said to be in a parallel lens to the pyrite and its nature was not noticed.

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[1] Personal communication, 1953.

In 1951 and 1952 Candela Development Co. carried out a magnetometer survey followed by diamond drilling. Six holes were drilled on claim W.D. 404. Logs of the drilling were kindly made available by the company (Candela Development Company, Northland property drill logs).

In 1957 Reef Explorations Ltd., had an electromagnetic survey made of the vicinity of the shaft and of all the south part of James Lake. One drill hole was put down about 1,400 feet north of the shaft. A record of the survey and a log of the drillhole is available (Reef Explorations Ltd., Assessment Work Reports, Best township).

In 1965 information having a bearing on the southerly extension of the pyrite-bearing zone south of the shaft was obtained by a magnetometer and electromagnetic survey carried out for Ajax Mines Ltd. (Ajax Mines Ltd. Dunmor property, company report, Best township).

Metallic minerals reported in the pyrite deposits include pyrite, pyrrhotite, chalcopyrite, and gold.

Fraleck (1907, p. 165) reported that shipments up to 1 July 1906, were 220 tons averaging 42 percent sulphur. The best assay returns of sulphur from samples taken from Candela Development Co. Ltd. drill core were reported as follows: 15.3 feet at 21.4 percent; 38.5 feet at 22.96 percent; 52.5 feet at 13.56 percent; 13.8 feet at 28.68 percent (Candela Development

Company Ltd., Drill logs, Best township). Fraleck (1907, p. 165) reported massive pyrrhotite on each wall of the lenses and occasionally pyrrhotite finely disseminated through the pyrite.

Apparently at no place has chalcopyrite been found in economic amounts. Assay returns of three samples taken by Sylvanite Gold Mines Exploration Dept. from near the shaft in 1942 are as follows:

	Ni percent	Co percent
1. Pyrrhotite from old core at surface	None	0.08
2. Pyrite from old loading platform	None	0.06
3. Pyrite and pyrrhotite from dump	Trace	0.40

Assay returns from samples taken from Candela Development Company drillholes showed negligible copper content and nearly a complete absence of nickel and gold (Candela Development Company, Northland property, Drill logs). Assay returns from three samples taken by Reef Explorations Ltd. from their drillhole No. 8 about 1,400 feet north of the shaft were as follows:

4-foot sample estimated 40 percent sulphides, copper 0.06 percent; 3.5-foot sample, estimated 25 percent sulphides, copper 0.29 percent; 9-foot sample, estimated 25 percent sulphides, 0.07 percent copper.

Fraleck (1907, p. 165, 183) reported that the pyritic bodies occurred in overlapping lenses in a fahlband which had been traced for a quarter of a mile at that time. At the open cut grey to white bedded siliceous rock, identified by Todd (1926, p. 104) as banded tuff, striking about N20°E, is exposed. Todd mentions the presence of a porphyritic acid dike a few feet to the east of the open cut and at one point a small mass of serpentinous material associated with the sulphides. Presumably this is the same rock as the "soft green schist" which Fraleck (1907, p. 165) stated contains the pyrite lens at the shaft and dips 70°W. The tuff is presumably on the east side of schisted andesitic pillow lava which is exposed at the southwest end of James Lake. About 120 feet west of the shaft is coarse granite. The tuff band containing the pyritic lenses appears to be a stratigraphic horizon in the Keewatin. By geophysical work and diamond drilling Candela Development Co. Ltd. (Candela Development Co. Ltd., Drill logs, Best township) traced and tested the horizon for about 1,200 feet south and 800 feet north of the shaft. Reef Explorations Ltd. (Reef Explorations Ltd., Assessment work reports, Best township) showed the extension of the horizon north of the shaft to about 1,200 feet from the shaft by geophysical work and drilling. Geophysical work suggesting the position of the southerly extension of the horizon to 2,000 feet from the sahft has been done by Ajax

Mines Ltd. (Ajax Mines Ltd., Dunmor property, Company report, Best township).

Workings at the mine include a shaft, which Fraleck (1907, p. 165) states is inclined 70 degrees to the west, an open cut whose north end is about 150 feet a little east of south from the shaft, a cribbed pit about 60 feet northeast of the shaft, and a number of old trenches.

Corkill (1908, p. 82) reported the shaft to be 170 feet deep with the first level at 100 feet; Fraleck (1907, p. 165) intimates that the first level is at 70 feet. From Corkill's (1908, p. 82) description the writer infers that the shaft workings are connected with the open cut. The open cut from its south end to where it reaches the shore of the little bay of James Lake which intervenes between the open cut and the shaft is about 155 feet long; the width of the cut varies from 10 to 25 feet; the long direction is about N33^{o}E; it is not in line with the shaft.

The pyrite deposit at Northland Pyrites mine has similarities to the pyrite deposit on claim J.S.32, Block 9, Gillies Limit township, which has been described by Thomson (1960, p. 51).

J.C. Sutherland Copper Occurrence, on Claim T.27817, Gillies Limit

The J. Sutherland copper occurrence on claim T.27817 is in Block 95, Gillies Limit township. It is situated (see Figure 2) on the east side of Highway 11 about 70 feet from the shore of Whitney Lake.

The showing consisted of chalcopyrite in quartz veinlets, which also contain carbonate and deep green chlorite, in Coleman conglomerate. The quartz veinlets make up a gently dipping group nearly all of whose lateral extension has been removed by erosion. At one time an area of chalcopyrite about 2½ feet by 1 foot was exposed at surface; most of this has been blasted away. A sample of chalcopyrite submitted by the writer to the Laboratory Branch, Ontario Dept. Mines gave on assay: gold-trace, silver-none.

In 1950 exploration of the showing included removal of overburden by bulldozer.

WKT Cobalt Occurrence, Best Township

The WKT cobalt occurrence is in Best township south of the southeast end of Rib Lake.

The occurrence consists of a vein, less than one inch wide, striking N70°W., and dipping 78°N., that intersects Nipissing diabase. In the vein galena and pyrite are present in carbonate gangue; in the wall rock at the margin of the vein is disseminated cobalt arsenide. A pink aplite dike up to 5 inches wide is near the vein. At the time of the writer's visit (1965) exploration of the vein was only started; a preliminary sample showed silver present to less than a ounce per ton. A pit less than 10 feet deep and trenches had been put down on the vein many years previously.

In 1965 prospecting and exploration were being done by the WKT Mining and Exploration Co.

Presumably the vein had been discovered about 1910; the claim on which it occurred then was designated HR.1446. The numerous, and in places deep, trenches in the vicinity showed that at that time the surface had been carefully prospected.

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Sutherland, J., Claim T.26934.
Assessment Work Drill logs (Gillies Limit, Block 95). Received O.D.M. Cobalt Resident Geologist's Office, Jan. 1, 1961.

Maps

Canada National Topographic Series
Timagami 31M/4E; Surveys and Mapping Branch, Dept. Mines and Technical Surveys. Scale 1: 50,000; contour interval 50 feet. Published 1962.

Timagami 31M/4W; Surveys and Mapping Branch, Dept. Mines and Technical Surveys. Scale 1: 50,000; contour interval 50 feet. Published 1962.

Geol. Surv. Canada
Map 510G, Timagami, Ontario, Aeromagnetic Series (advance edition); scale 1 inch to 1 mile. Published 1957.

Map 1491G, Timagami, Ontario, Aeromagnetic Series; scale 1 inch to 1 mile. Published 1965.

Ontario Bureau Mines
Map 19e. Map of the cobalt-nickel-arsenic-silver area, near Lake Temiskaming, Ont. (Third edition enlarged); scale 1 mile to 1 inch. (accompanies O.B.M., Vol. XIX, pt. 2).

Ontario Dept. Mines.
Map 35c. Anima-Nipissing Lake area; scale 1 mile to 1 inch. (Accompanies O.D.M., Vol. XXXV, pt. 3). Geology by E.W. Todd; published 1926.

OFR 5016

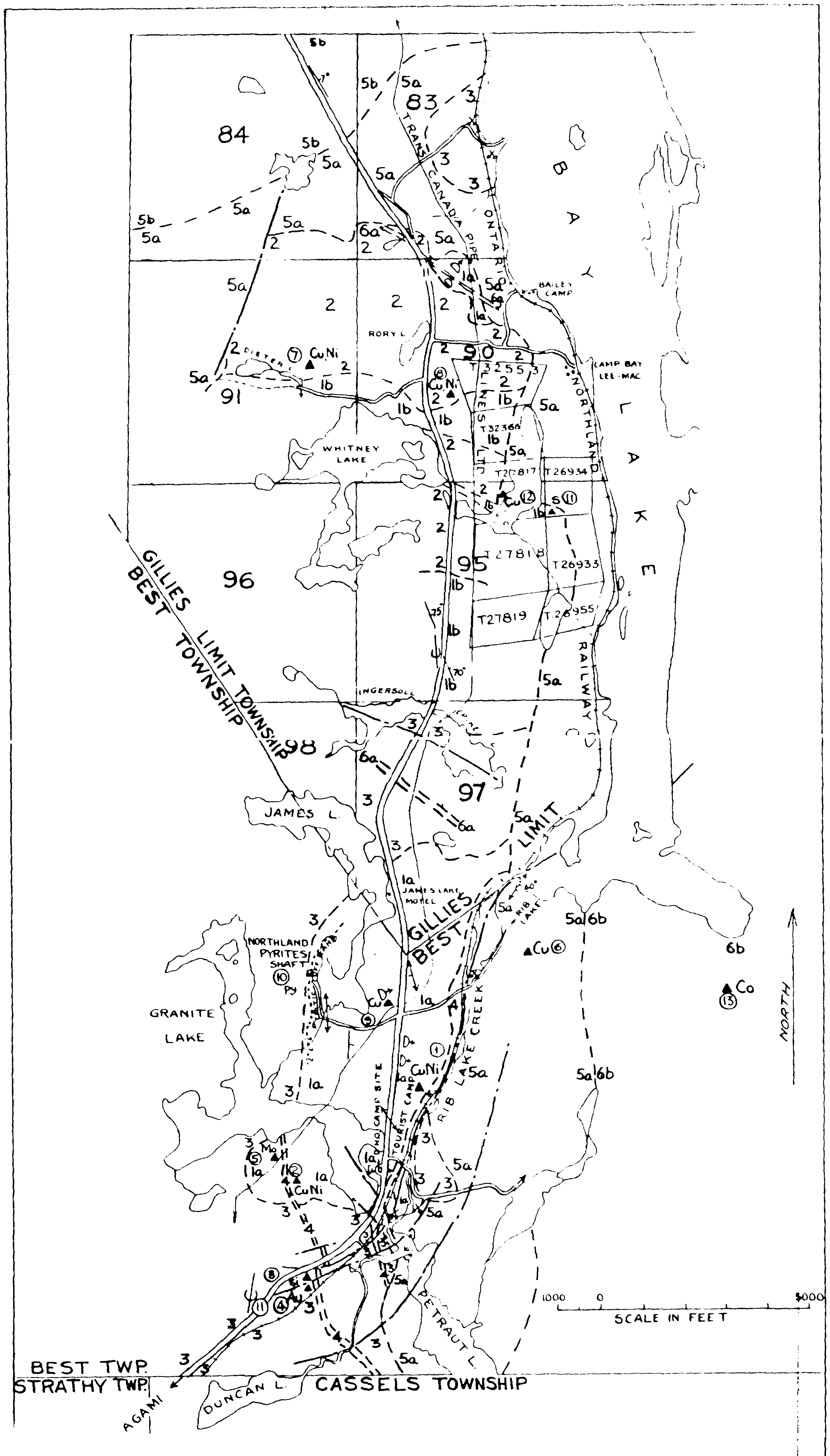

FIGURE 1

GEOLOGICAL MAP OF PARTS OF BEST TOWNSHIP AND GILLIES LIMIT TOWNSHIP ADJACENT TO HIGHWAY 11, DISTRICTS OF TIMISKAMING AND NIPISSING.

LEGEND

PRECAMBRIAN
PROTEROZOIC
KEWEENAWAN
6 — 6a Diabase (dikes)
INTRUSIVE CONTACT
HURONIAN
COBALT GROUP
Firstbrook Formation
5 — 5b Argillite
Coleman Formation
5a Conglomerate, arkose
UNCONFORMITY
ARCHEAN
MATACHEWAN
4 — 4 Diabase, altered (dikes)
INTRUSIVE CONTACT
ALGOMAN
3 — 3 Granitic rocks
INTRUSIVE CONTACT
HAILEYBURIAN
Whitney Lake Intrusions
2 — 2 Gabbro, peridotite, metapyroxenite
INTRUSIVE CONTACT
KEEWATIN
1 — 1a Mafic and intermediate lavas, bedded tuff, diabase (sills or dikes)
1b Felsic volcanics

GEOLOGICAL AND MINING SYMBOLS

Glacial striae.

Bedding, top unknown; (inclined, vertical).

Lava flow; top (arrow) from pillows shape and packing.

Schistosity; (horizontal, inclined, vertical).

Foliation; (horizontal, inclined, vertical).

Geological boundary, position interpreted.

Lineament.

Shaft.

Gravel pit.

MINERAL OCCURRENCES REFERENCE

Au .... Gold
Cu .... Copper
Mo .... Molybdenum
Ni .... Nickel
S .... Sulphide mineralization
si .... Silica

LIST OF OCCURRENCES AND PROPERTIES

1. Acana Mines Ltd., East Group (circa 1952) .... Cu,Ni
2. Acana Mines Ltd., West Group (circa 1952) .... Cu,Ni
3. Cuniptau silica occurrence .... si
4. Danlau Mines gold occurrence .... Au
5. Guppy molybdenite occurrence .... Mo
6. McLean, N., copper occurrence .... Cu
7. Nickel Rim Mines Ltd., Dieter Lake occurrence ... Cu,Ni
8. Nickel Rim Mines Ltd., Highway 11 occurrence .... Cu, Ni
9. Niemetz, H., copper occurrence .... Cu
10. Northland Pyrites mine (former producer) .... py
11. Sulphide mineralization, claim T.26934, Block 95, Gillies Limit .... S
12. Sutherland, J., copper occurrence, claim T.27817, Block 95, Gillies Limit .... Cu
13. WKT cobalt occurrence .... Co

SOURCES OF INFORMATION

Geology by Robert Thomson, 1966.

Base map compiled by Robert Thomson from maps of Forest Resources Inventory, Ontario Department of Lands and Forests with additions by Robert Thomson.

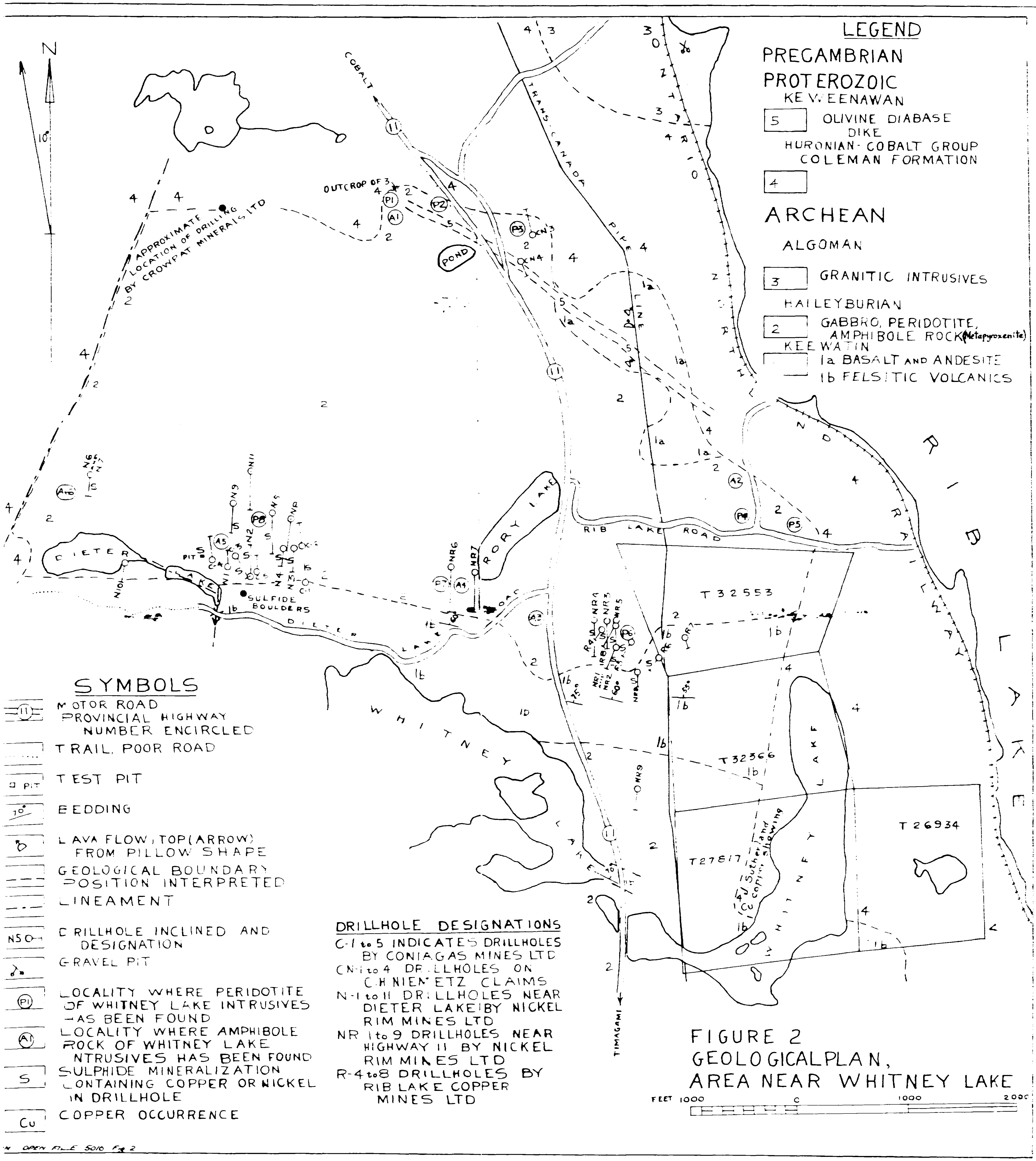

FIGURE 2
GEOLOGICAL PLAN,
AREA NEAR WHITNEY LAKE

OPEN FILE 5010 Fig 2

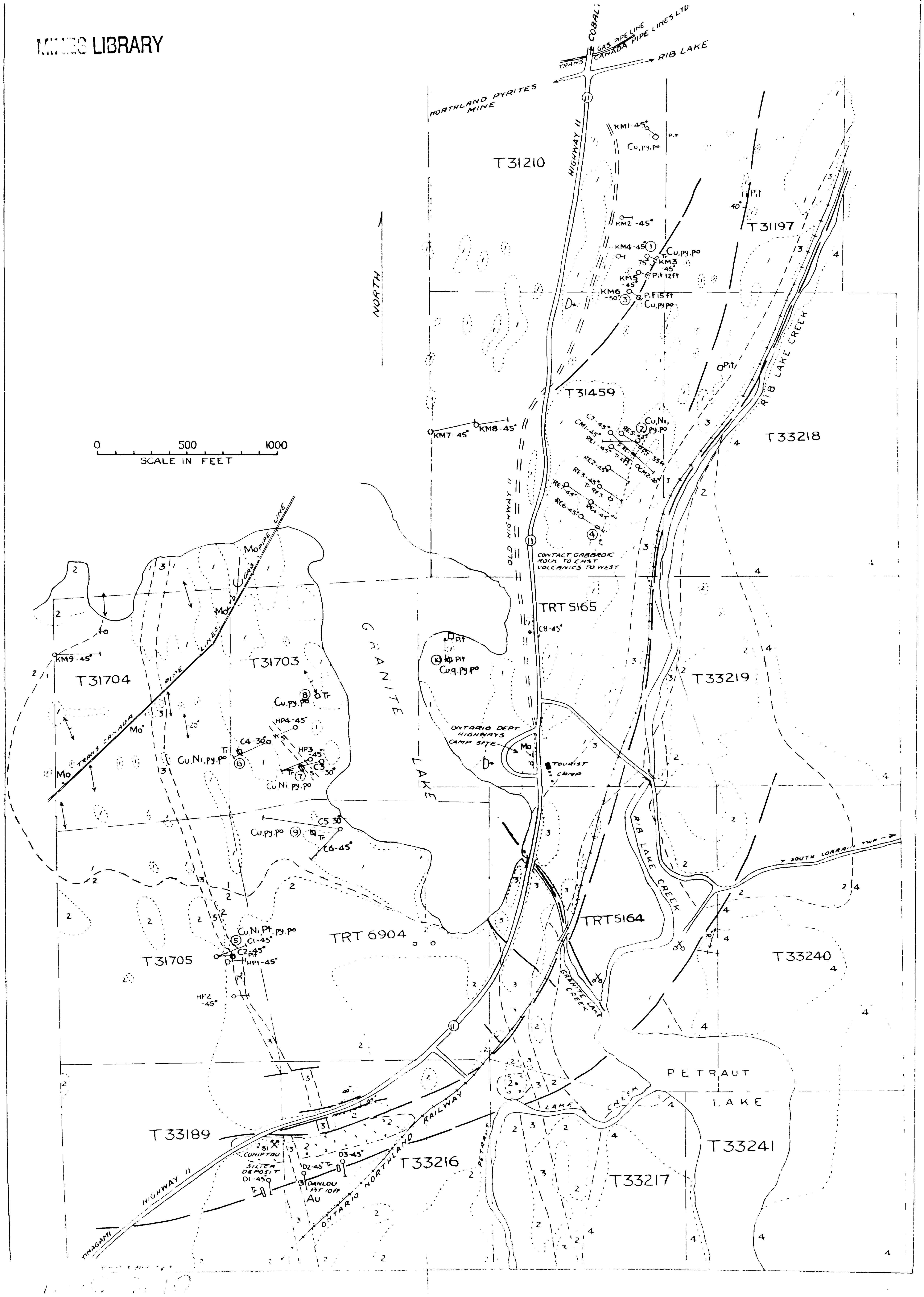

FIGURE 5

GEOLOGICAL SKETCH MAP OF ACANA MINES LIMITED CLAIM GROUP (AS OF 1952).
After geological plan prepared by Geo-Technical Development Co. Ltd., November, 1952, with modifications and additions by Robert Thomson, 1966.

LEGEND

PRECAMBRIAN

PROTEROZOIC

Keweenawan

4	Diabase (dikes)

Intrusive contact

Huronian, Cobalt Group, Coleman Formation

4	Conglomerate, arkose

Unconformity

ARCHEAN

Matachewan

3	Diabase (dikes)

Intrusive contact

Algoman

2	Granite, including reported syenite-diorite-gabbro area east of Rib Lake Creek

Intrusive contact

Keewatin

1	Volcanics (andesite, dacite, tuffs) and associated mafic intrusive rocks

s s s	Highly silicified granite with associated quartz veins

GEOLOGICAL AND MINING SYMBOLS

- Area of bedrock outcrop.
- Strike and dip
- Lava flow; top (arrow) from pillows shape and packing.
- Schistosity; (inclined).
- Geological boundary, position interpreted.
- Lineament or fault.
- Drill hole; (vertical, inclined). Note A.
- Vein or mineralization
- Test pit with depth in feet.
- Trench. Note B.
- Quarry
- Gravel pit.
- Claim number of unsurveyed claim in group controlled by Acana Mines Ltd. in 1952.
- Mineral showing of Acana Mines Ltd. The positions of 10 showings are indicated.

Note A. Letters indicate company or persons who drilled holes.
C ... Cheskirk Mines Ltd.
CM .. Central Milner Mines Ltd.
D ... Danlou Mines Ltd.
HP ... Huclif Porcupine Mines Ltd.
KM ... Quebec Metallurgical Industries Ltd.
RE ... Reef Explorations Ltd.

Note B. Letters indicate company or persons who made them and their number for trench is given. See list under Note A.

MINERAL OCCURRENCES REFERENCE

Au	Gold	Pt	Platinum Group Metals
Cu	Copper	py	Pyrite
Mo	Molybdenum	q	Quartz
Ni	Nickel	si	Silica
po	Pyrrhotite		

SOURCES OF INFORMATION

Geology by Robert Thomson, 1966.

Base map compiled by Robert Thomson from maps of Forest Resources Inventory, Ontario Department of Lands and Forests with additions by Robert Thomson.